LIONS, LIVESTOCK, AND LIVELIHOODS:

UNDERSTANDING HUMAN-PREDATOR RELATIONSHIPS IN BOTSWANA

A Dissertation

by

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ABSTRACT

This research examines interactions between local people and predators as they are shaped by land use policy in Botswana. Human relationships with wildlife are influenced by livelihood strategies; livelihood choices, in turn, are shaped by governmental designation of land use. I investigate how livelihoods and land use interact to determine the costs and benefits local people derive from wildlife, and how those costs and benefits influence attitudes towards and tolerance of wildlife. This dissertation focuses on two rural villages located on either side of a wildlife-agriculture boundary in the Okavango Delta.

This dissertation has three objectives: 1) investigate how 16 years of participation in the CBNRM program has shaped participants' knowledge of community-based conservation, 2) evaluate how livelihood strategies have affected human-predator relationships, and 3) assess the linkages between local human-predator relationships, national land-use policies, and the behavior of large predators in the Okavango Delta.

To address the first objective, analysis was performed on qualitative interviews. Responses from interviews revealed participation in CBNRM has led to increased knowledge and sense of ownership of CBNRM as well as increased perceived benefits from the program. For the second objective, I asked residents about their attitudes towards and tolerance of lions and elephants in the village participating in CBNRM as well as residents in the neighboring village in the agricultural zone. I found significant differences in attitudes between residents in the wildlife zone and residents in the agricultural zone. The difference in tolerance to elephants and lions was less pronounced.

Finally, I used a social-ecological approach to reveal how land-use policy influences relationships between local villagers and wildlife. I found that land use designations have placed serious constraints on the livelihood options for people in both villages, while simultaneously giving people in both villages access to new international markets, namely safari tourism for the wildlife area and beef export for the agricultural side. In this context, lions have become important drivers of both markets. These results highlight the importance of evaluating community-based conservation projects, as well as human-wildlife conflict, not in a vacuum but as part of a wider social-ecological system.

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Contributors

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER I

INTRODUCTION

Statement of the Problem

Conflict between wildlife and humans is one of the world's most intractable conservation problems (Dickman 2010). The conflict most commonly results from wildlife predation on livestock and crop raiding by species as varied as rodents and elephants (White & Ward 2010). But while the term human-wildlife conflict implies direct antagonism between a group of humans and a wildlife species, conflict is often the manifestation of deeper problems between groups of people with differing priorities (Young et al. 2010). This is particularly true for conflict involving large predators, livestock, and people. Wildlife predation on livestock often is associated with wider social, economic, and political tensions relating to land management (Redpath et al. 2015). Conflict are most frequent and extreme at the boundaries of agricultural zones and protected areas. In Botswana, the tensions are especially significant. Most of the country's land is divided between conservation areas and agricultural land, supporting either safari tourism or beef production, two of the biggest industries in the country (Darkoh & Mbaiwa 2002). As revenues for diamond mining, Botswana's biggest industry, decline, tensions between conservation and agriculture will intensify and manifest as human-wildlife conflict (HWC).

Botswana's land-use policies designate most communal and public lands either for wildlife management or for livestock and agriculture (Tordoff 1988). But supporting both industries creates challenges, particularly at the boundaries. Large predators are

emblematic of this challenge as they are an important tourism draw and therefore a management priority in wildlife areas. Simultaneously, large predators are a significant threat to livestock, and have been documented crossing fences to feed (Valiex et al. 2012, Cozzi et al. 2013). In addition, diseases such as foot-and-mouth can be transmitted from wildlife populations to livestock (Mbaiwa & Mbaiwa 2006). For this reason, the Botswana government began installing a series of veterinary cordon fences in the 1950s. The fences served to stop the spread of disease to livestock, but they have also become the political boundaries that separate livestock zones from wildlife zones. One of the veterinary fences is located in the Okavango Delta, Botswana's most popular safari tourism destination (Cozzi et al. 2013).

The Okavango Delta supports some of the highest densities and diversity of wildlife in Africa, including populations of large African carnivores (lions, spotted hyenas, leopards, African wild dogs, and cheetahs) (McNutt 2001). The veterinary fence along the southern edge of the Delta was installed in 1982 (Mbaiwa & Mbaiwa 2006). This was followed shortly after by the adoption of the Community-Based Natural Resource Management (CBNRM) initiative, which began as a series of policies and programs aimed at encouraging local people to conserve wildlife by giving them a direct stake in benefits derived from the wildlife tourism industry (Dressler et al. 2010). CBNRM began with the Wildlife Conservation Policy of 1986 and gained momentum with other community-based conservation policies and programs through the 1990s (Mbaiwa 2011).

Today, conservation scholars and practitioners in Botswana—and throughout southern Africa where CBNRM initiatives have sought to build local stewardship of wildlife

for nearly two decades—are questioning the results. Has CBNRM truly been effective at balancing wildlife conservation with tourism development and livelihood benefits for local communities? And how has the CBNRM Program impacted conflict between wildlife and people? Empirical evidence remains elusive, and the voices of local villagers are mostly absent from the debates.

Literature Review

Within the field of human-wildlife conflict, the subfield of human-predator conflict (HPC, also called human-carnivore conflict) has considerable scholarship dedicated to understanding the conditions under which local people are more likely to tolerate predators, and the prospects for long-term coexistence between people and carnivores. Scholars in the field have advanced our understanding of the ecological drivers of livestock depredation (Valiex et al. 2012), the attitudes and behaviors of local people towards predators (Naughton-Treves et al. 2003), and the factors that increase the likelihood of conflict (Inskip & Zimmermann 2009, Hemson et al 2009). Those with a social-ecological approach move beyond a local focus on how people are in conflict with predators to include an understanding of the larger social, economic, and political decisions that brought people into close proximity to predators and helps shape their interactions.

This study took a social-ecological approach to understanding HPC, drawing from methods in the social-ecological systems (SES) and political ecology literatures. These fields conceptualize local, social-ecological systems as nested within and influenced by national and international policies, regulations, and constraints (Blaikie & Brookfield 1987). The

human-predator relationships in the study villages seem to confirm this conception—the main livelihood strategies of residents in each village (mixed livestock-agriculture vs. wildlife tourism) are largely directed by national land-use policy. Yet a primary goal of CBNRM was to devolve national power in favor of village control, which should allow greater autonomy and decision-making power over tenured land. I investigated national land-use policies related to livestock and tourism and the effects on villagers' livelihood options and relationships to predators.

Community-Based Natural Resource Management

In the Okavango Delta, relationships between predators and local people are closely tied to the CBNRM initiative, as the populations of predators that draw tourists sometimes prey on livestock, especially near the boundaries of ranching and wildlife zones. CBNRM draws from the paradigms of sustainable development (Daly 1990) and community-based conservation (Western & Wright 1994). These paradigms developed in response to perceived problems with the preservationist model of conservation that focused on protected areas with strictly enforced no-use policies. In contrast, the new model started with the assertion that the needs of local people deserve consideration when developing conservation strategies. Furthermore, there is an assumption that achieving local conservation objectives is more likely if local people receive incentives and benefits by participating in conservation (Mbaiwa et al. 2011). More recently, a number of scholars have questioned the effectiveness of these more people-centered conservation

approaches, both on theoretical (Locke & Dearden 2005) and empirical (Blaikie 2006) grounds. The debate between proponents of these approaches continues.

The trajectory of CBNRM scholarship has been similar to that of larger debates regarding sustainable development versus preservationist approaches (Dressler et al. 2010). After its conception in the late 1980s, CBNRM gained support from national policy-makers as well as an array of international conservation and development donors (Kgathi et al. 2004). The core principle of CBNRM is to devolve power from national government to local communities. The devolution of decision-making authority to communal institutions is theoretically "accompanied by real benefits for local resource users as well as secure rights to land and livelihood, and capacity building for management skills" (Mbaiwa et al. 2011). CBNRM has been official policy in the Okavango Delta for almost twenty years, yet evidence of success has remained elusive. Some studies have failed to show any measurable conservation outcomes, and others have argued the program has failed to provide adequate benefits to local communities (Blaikie 2006). What remains unclear is whether this failure comes from a flaw in the community-based concept, or because the program was not implemented in the correct manner. Therefore, a goal of my study was to explore whether CBNRM succeeded in providing appropriate incentives, and whether those incentives shaped more conservation-oriented attitudes and behaviors, especially in relation to predators.

Human-Predator Conflict

The proximity of wildlife populations and rural peoples has been known to cause HWC all over the world, threatening both wildlife conservation and the livelihoods of local people (Woodroffe et al. 2005, Naughton-Treves et al. 1998). Large-bodied predators are especially predisposed to conflict with people, usually because of predation on livestock or occasionally due to direct attacks on humans (Inskip & Zimmermann 2009). This tendency for conflict is due to the predators' dietary requirements and large home range size (Macdonald & Sillero-Zubiri 2002). This conflict seems only to be increasing in frequency across much of the world, as more conservation areas are established, and as human settlements expand in rural areas (Treves & Karanth 2003, Robbins et al. 2007). The trends are intensifying Human-Predator Conflict (HPC) at the boundaries of conservation territories and agricultural production (Zimmerer 2006).

To evaluate the effectiveness of conflict mitigation, HPC scholars have focused on several aspects of the interactions. One approach has been to address the ecological patterns and drivers of wildlife predation on livestock (Hemson et al. 2009). Research on predatory behavior of carnivores could help explain and predict circumstances when predation is more likely to occur. Marker et al. (2003b) analyzed prey preferences of cheetahs on Namibian farmlands to assess the level of threat posed to livestock. Treves et al. (2004) used data of depredation of livestock by wolves to predict which land management strategies and ecological zones were most at risk of human-wolf conflict. A number of factors have been found to contribute to high levels of conflict, including habitat and natural prey availability, livestock husbandry practices, and human activity and

behavior patterns (Inskip & Zimmermann 2009). These types of studies tend to be conducted by natural scientists, such as biologists and ecologists, and most use a case-study approach (Graham et al. 2005). While patterns and trends certainly exist, finding universally applicable factors and proving causal mechanisms has proven difficult. For example, several studies have found animal husbandry practices to be critical to minimizing livestock predation (Mech et al. 2000, Gusset et al. 2009, Treves & Karanth 2003), but a meta-analysis by Graham et al. (2005) failed to find a correlation between predation and methods of husbandry. Scholars have identified several priorities for future research, including an increased emphasis on experimental design as well as the standardization of data collection to help facilitate analysis across sites and regions (Inskip & Zimmerman 2009, Graham et al. 2005).

A second approach to understand and mitigate HPC has been to investigate the attitudes and behaviors of local people towards predators. These projects can be descriptive, designed to understand how local people feel about predators before the implementation of a new management policy or conservation project (Oli et al. 2004, Lindsey et al. 2005). Such studies have been conducted on wolves and other predators in North America (see Williams et al. 2002 for a review of 38 studies), and African carnivores (Lindsey et al. 2005, Rodriguez 2008, Marker et al. 2003a). Data sets regarding attitudes towards predators have been used to test for correlations between variables such as income level or education (Kaltenborn et al. 1999, Williams et al. 2002), or more rarely to test for differences in attitudes across time or space (Naughton-Treves et al. 2003, Hemson et al. 2009). Although these studies have provided important insight into human-predator

conflict, relatively few theoretically-driven, social science or interdisciplinary studies have examined the complex interactions between local people, predators, and larger government initiatives (but see Chhangani et al. 2008).

In summary, this dissertation aims to help answer the question of whether wildlife tourism is a good strategy for building local incentives for conservation and assuaging local HPC. It also evaluates the results of the 1982 decision to erect the veterinary fence and how the measure affected local livelihoods, wildlife conservation, and HPC. More theoretically, the study contributes to community-based conservation and HPC scholarship by revealing how national land use policies related to two livelihood strategies--cattle production and wildlife tourism--have shaped the relationship between people and predators in the Okavango Delta.

Research Objectives

The overall research aim is to determine how land-use policies in Botswana affect livelihoods, wildlife, and local human-predator relationships. To accomplish this, I used a mixed-method, social-ecological approach. I defined human-predator relationships as having two inter-related components: local people's attitudes towards and their encounters with sympatric predators. I defined encounters as wild predator sightings (either in a threatening or a wildlife-viewing context), cases of livestock predation, and retaliatory killings of wildlife. I formulated three specific research objectives:

Research Objective #1: Investigate how 16 years of participation in the CBNRM program has

shaped participants' attitudes towards and knowledge about wildlife and community-based conservation.

Research Objective #2: Evaluate how livelihood strategies have affected human-predator relationships on each side of the veterinary fence.

Research Objective #3: Assess the linkages between local human-predator relationships, national land-use policies, and the behavior of large predators in the Okavango Delta.

The core of the dissertation research was ethnography focused on the study villages of Shorobe and Sankuyo. I used a comparative case-study approach to comparing the villages and their contrasting land-use policies (Yin 2003), drawing on over 17 months of field work in the two communities.

Methodology

Study Site

In the field research, I gathered ethnographic data to document perspectives of local villagers on the role of CBNRM in balancing conservation and development in Botswana. The study site is in the eastern Okavango Delta where the residents of two villages have been separated by the veterinary fence since 1982. When the fence was installed, the villages of Sankuyo and Shorobe were similar in size and ethnic makeup, and people in both subsisted primarily on mixed agriculture (Mbaiwa 2011). In subsequent years, cattle ranching became illegal in Sankuyo but continued in Shorobe. As part of the CBNRM initiative, the people of Sankuyo kept tenure over their land within the wildlife management

zone, and were given the authority to manage the land for wildlife while partnering with safari operators (both hunting and photographic) to gain direct economic benefits (Mbaiwa 2011). The village of Shorobe, however, was designated as outside the wildlife management zone, and therefore not able to benefit directly from tourism. Livestock and agriculture continued and remains the most important livelihood strategy for residents there. A comparison of these two villages gave insights on the impacts of CBNRM and the veterinary fence and on how the shift to wildlife tourism has changed the way locals relate to wildlife.

Institutional Support

During the course of my research, I worked closely with several local institutions, including the Okavango Research Institute (ORI), the Botswana Predator Conservation Trust (BPCT), and the Sankuyo Tsharangano Management Trust (STMT). As a visiting student at ORI, I was hosted by and worked closely with Dr. Joseph Mbaiwa, a Professor at ORI who has been conducting social science research in Shorobe, Sankuyo, and nearby areas for over 20 years. Dr. Mbaiwa provided crucial assistance throughout the research process in both villages. While living and working in Shorobe, I worked closely with BPCT and their Shorobe Livestock Insurance Initiative (SLII). SLII is a pilot insurance compensation program designed to reduce conflict between predators and Shorobe residents by encouraging strong animal husbandry and mitigating predator damage to livestock. While in Sankuyo, I collaborated with the STMT, which is managed by the village and responsible for Sankuyo's CBNRM program.

Research Design and Data Collection

This research was ethnographic and involved the collection of qualitative and quantitative data. The major data collection methods were participant observation, semi-structured interviews, structured interviews, and key informant interviews.

Participant Observation

As a participant observer, I established a temporary residence in both villages, met and interacted with local residents, and participated in community activities in order to understand how sympatric predator populations affect people in each village, and how agriculture vs. tourism shape people's attitudes towards predators. Data collection for this type of research involved systematic note-taking in a field journal recording all relevant interactions with locals and activities participated in. (Dewalt and Dewalt 1998, Bernard 2000). Examples of observed activities include the community kgotla meetings regularly held in both villages, time spent with farmers working at cattle posts, and attendance of special events such as weddings and funerals . Kgotlas are community or tribal meetings where community issues are discussed and decisions are made (Somolekae 1998). Because these meetings have a strong tradition of debate and discussion, they are an ideal place to learn what issues are particularly important to the community.

Through my affiliation with BPCT, my first interactions in Shorobe came as a participant in the Shorobe Livestock Insurance Initiative (SLII). I lived in a room in the center of the village, and spent around three months working primarily with Shorobe farmers as part of SLII. SLII was a small project with two full-time employees, one a local from Shorobe

and the other from a nearby area. We spent our time talking with farmers about problems with predators, helping encourage strong animal husbandry practices (including helping build or repair several kralls, locally made livestock enclosures), and signing farmers up for predator insurance. From April through June 2012, I transitioned to collecting my own data, by conducting interviews and participant observation. I retained the local Shorobe employee of SLII as my research assistant, who translated for me during all interviews.

As a part of the SLII, we had an interesting relationship with residents. The program was seen as an outsider project (paid for by conservationists from the city), but because it was so small and employed a Shorobe resident, was viewed a bit more openly than similar projects that were bigger and had less connection to the community. Because Shorobe is located near ORI and Maun (the regional capital), it has been the focus of many research projects and surveys, and there were some signs of research fatigue from residents, especially when first meeting them. However, as one of very few researchers to live in Shorobe itself, and by sending so much time with farmers at cattle posts, many residents became more familiar with me than researchers who conducted interviews but no ethnographic research. I believe this familiarity did help foster some additional trust from many residents, which was crucial for ensuring more valid data and a greater understanding of human-predator conflict in the area. I lived in Shorobe for around nine months over two field seasons in total.

In Sankuyo, I was introduced to members of the STMT management (all Sankuyo residents) by Dr. Mbaiwa, and lived in a tent in the household plot of my field assistant's family. I lived in Sankuyo for six months during my second field season in 2013. As one of

Botswana's flagship CBNRM programs, Sankuyo has been part of an even greater number of research projects than Shorobe, and research fatigue was an issue here in particular. By taking an ethnographic approach, living in the village and having a local resident as my field assistant, people became more comfortable around me and maybe that helped build trust and reduce fatigue. Only one person refused to be interviewed out of over 70 requests. However, I would say the barrier or distance between me and most residents was slightly larger in Sankuyo than Shorobe. Sankuyo has been the subject of a large number of studies and interviews since the inception of the CBRNM program, and as such many residents considered participating in interviews to be a necessary burden of having the Trust

Semi-structured Interviews

I conducted semi-structured interviews with residents of Shorobe and Sankuyo. Following Bernard (2000), semi-structured interviews follow an interview guide, but are flexible enough to allow the interviewer to pursue interesting topics as they come up. Interviews with community members explored their perceptions of their environment, with a focus on broad cultural connections to and conceptions of predators, as well as how predators affect their everyday lives and livelihoods. I conducted a total of 31 semi-structured interviews. Following recommendations from local experts with extensive experience conducting interviews in the region, I decided not to record interviews (semi-structured or structured) with an audio recorder, as using such a device could lead to distrust or outright refusal to participate (J. Mbaiwa, personal comm.). Instead I took extensive notes by hand during each interview, and went back to supplement those notes

with additional thoughts and observations before the end of each day. These interviews took between 45 minutes and two hours, and all but three were done in Setswana with a translator (the other three were done in English). In each village, I relied on a field assistant from that village who had previous experience conducting interviews with researchers. I used a snowball sampling method for these interviews, asking interviewees for suggestions of others who had knowledge and experience with wildlife tourism and/or conflict with predators.

Structured Interviews

Structured interviews served as the core data for objectives 1 and 2. Again following Bernard (2000), structured interviews follow a set script in order to create comparable data. For objective 1, I conducted 15 structured interviews with members of Sankuyo's CBNRM project. The interviews (see Appendix A for full list of interview questions) included the same questions asked to the same individuals 16 years prior, when the CBNRM project was originally established. For objective 2, I conducted 90 structured interviews with Shorobe residents and 66 with Sankuyo residents. These surveys (see Appendix B) were designed to gather data on livelihood strategies and residents' attitudes towards and encounters with predators. Each interview took between 40 and 90 minutes to complete, and were conducted in Setswana with a translator. For Shorobe cattle posts, I used a targeted sampling strategy, with the goal of interviewing every head of cattle post. I was able to interview 60 of 67 heads of cattle post, and these were designed to be directly compared to Sankuyo heads of household. To complement these data, I used stratified, convenience-

based sampling (stratified by neighborhood) to interview an additional 30 people who lived in the village to obtain data for use in regressions. In Sankuyo, I was able to interview 44 of 49 heads of household. With stratified, convenience-based sampling (stratified by neighborhood), I also interviewed an additional 22 residents who were not heads of household.

Key Informant Interviews

In addition to the work done in Shorobe and Sankuyo, I also interviewed relevant government and NGO personnel with expertise in the wildlife and livestock management policies and strategies that are relevant to the villages of Sankuyo and Shorobe. The purpose of these key informant interviews was to understand the wider regional, national, and international political economic contexts that shape livelihoods and human-predator relationships at the village level. I conducted 16 such interviews, using the snowball method to identify key actors who inform decisions regarding wildlife and livestock management regimes in Botswana. These data were primarily used for Objective 3 (assess the linkages between local human-predator relationships, national land-use policies, and the behavior of large predators). Key informant interviews focused on the respondents' area of expertise in relation to the research, and these interviews lasted between 45 minutes and two hours. Some examples of interview subjects for these interviews included members of the Department of Wildlife and National Parks and the Botswana Meat Commission, as well as NGO employees with experience working in the area.

Timeline

I conducted fieldwork over three periods. From June-August 2011, I performed preliminary field work, scouting Shorobe and Sankuyo as field sites. I conducted a number of preliminary interviews, which informed the overall research plan as well as the final semi-structured and structured interview questions. In addition, I made connections with several collaborators, including the Botswana Predator Conservation Trust (BWCP) and the Okavango Research Institute (ORI) whose assistance proved crucial throughout the research process.

From January-August 2012, I established residence in Shorobe and conducted field research there, which included participant observation as well as the bulk of the semi-structured and structured interviews for Shorobe. I also worked with BPCT during this time, assisting with their Shorobe Livestock Insurance Initiative (SLII), which provided opportunities to work with and learn from Shorobe farmers. In August 2012, I did some preliminary trips to Sankuyo to plan for the next field season.

From January-August 2013, I resided between Shorobe and Sankuyo and conducted semi-structured and structured interviews primarily in Sankuyo. In addition, I finished interviews in Shorobe that I had be unable to complete the previous season, and also conducted key informant interviews with relevant stakeholders in Shorobe, Sankuyo, and Maun (the regional capital). In total, I spent over 17 months in Botswana, the majority of which I lived in Shorobe or Sankuyo villages, and conducted over 200 interviews.

Significance of the Research

This study contributes to our understanding of human-wildlife conflict and produces a theoretical and empirical evaluation of the CBNRM initiative. My approach allowed me to evaluate to what extent expected conservation incentives and local capacity building have taken place, and how locals' attitudes towards and tolerance of predators are shaped by receipt of tourism benefits. The comparative case-study approach allowed me to test for the impacts of land-use and associated livelihoods on attitudes towards and encounters with predators. The analysis has implications for the assumption that providing economic incentives from wildlife will automatically change local attitudes and behaviors towards conservation. In addition, using the comparative approach allowed me to track the tradeoffs of costs and benefits between two connected communities, rather than assess any potential positive outcomes in a vacuum. Finally, the multi-scaled approach helped me examine how local human-wildlife conflict are also symptoms of conflict between larger social, political, and economic forces. Overall, the results helped inform the wider debate between advocates of community-based conservation initiatives and more preservationist strategies.

This research also advances the understanding of the more practical side of human-predator conflict, specifically how management policies affect human-predator relationships. This information is critical for fine-tuning regional and national land-use policies such that the goals of conservation and production and of managing both wildlife and livestock can be reconciled. Finally, this dissertation has been part of my completion of the interdisciplinary Applied Biodiversity Science (ABS) NSF-IGERT Program at Texas A&M

University. The goal of the ABS program is to link social and ecological research to achieve meaningful conservation on the ground. Key components of the program include collaboration with local community groups and conservation NGO's as well as dissemination of all results to local residents, managers, and the academic community.

Field Realities and the Evolution of the Research

When I initially conceived of this research project, I intended to have an explicit ecological research component to complement the social science data collection and analysis. I proposed to conduct fence patrols with sandtrapping along the veterinary fence that separated Sankuyo's and Shorobe's land (and also designated to boundary between wildlife and livestock zones). By patrolling the length of the fence and recording all tracks and signs of predators, I hoped to identify holes dug under the fence or in the fence that served as regular crossing points for lions and other predators. These cross points would serve as locations for camera traps, which, if successful, would have provided data that could supplement BWCP's extensive camera trapping and radiotracking data for predators north of the fence. After conducting these fence patrols for 3+ weeks, however, it became clear that predators were not regularly utilizing specific holes or locations as crossing points. It appeared as though there were enough low points, holes, nearby trees, etc., that predators (especially lions) could cross easily and therefore weren't funneled through a small number of crossing locations. While this information was useful for BWCP, I abandoned plans to include camera trapping data as part of the dissertation.

Format of the Dissertation

I now briefly summarize the following chapters, which are designed to serve as standalone papers to be submitted to appropriate peer-reviewed journals. Chapter two explores the impacts of the CBNRM program by re-interviewing Sankuyo residents following seventeen years of participation in CBNRM. By asking individuals the same questions about CBNRM, once in the first year of the program, and again seventeen years later, I could analyze how Sankuyo's community conservation project has evolved over time, and how it has affected the way local people think and talk about conservation. While this analysis cannot provide evidence regarding the success of the conservation goals of CBNRM, it does show how community development and capacity building of the program has influenced how participants view the project and the ways in which they connect benefits from wildlife to their community. The data were not obtained directly from Shorobe or the other surrounding agricultural villages, but are useful for understanding how locals think about their environment. By reporting how Sankuyo resident attitudes have been shaped by CBNRM, I could deduce how these changes might be absent or less pronounced in villages like Shorobe that have been excluded from the program. This chapter concludes by discussing to what extent the project has met community development and capacity building goals of the CBNRM program, and how this relates to conservation of area wildlife.

Chapter three compares the attitudes and tolerance of various wildlife species between residents of Shorobe and Sankuyo. Using results from 156 surveys conducted in the two villages, it investigates how livelihoods and land use shape how residents relate to sympatric wildlife. The findings suggest that costs and benefits derived from wildlife

combine with deeper rooted, cultural factors to determine resident attitudes and tolerance of local wildlife. This analysis leads directly to chapter four, which takes a social-ecological approach by considering the Shorobe and Sankuyo tribal areas as a connected system found on either side of the wildlife/livestock boundary. The paper considers relevant social and ecological components of the system, focusing specifically on how they interact across the boundary and how they shape the relationship of local people with lions and other predators. By considering the bordering wildlife and livestock zones as part of a connected system, I show that the costs and benefits of lions are distributed unevenly across and between the two study areas. Furthermore, the analysis suggests that this uneven distribution will inevitably lead to some level of conflict, which has implications for programs designed to redistribute some of these benefits. Finally, I demonstrate that the distribution of costs and benefits may have a greater impact on the attitudes of local people towards lions than the tolerance of those lions. In the fifth and final chapter, I discuss the conclusions from this paper and how they connect and relate to previous chapters to present an overall understanding of the relationships between local people and predators in this study system.

CHAPTER II

CHANGES IN ATTITUDES AND UNDERSTANDING OF LOCAL PEOPLE FOLLOWING 16 YEARS OF PARTICIPATION IN COMMUNITY-BASED NATURAL RESOURCE MANAGEMENT IN THE OKAVANGO DELTA, BOTSWANA

Introduction

In response to the global biodiversity crisis, scholars and practitioners have searched for effective strategies to conserve declining wildlife populations. Traditional strategies relied on natural resource preservation and protection, often via the creation of protected areas that limited or excluded access to local people (Brockington 2004). While protected areas remain a core component in any global conservation strategy, the exclusion and disenfranchisement of local people is now recognized not as a solution to curbing wildlife declines, but rather as part a social injustice that ultimately impedes conservation (Norton-Griffiths & Southey 1995). In response to these critiques, a number of emerging paradigms gained popularity, beginning with Sustainable Development (Brundtland 1987), and including related subfields like Integrated Conservation and Development (ICDP), Ecotourism, and Community-Based Conservation (CBC) (Hackel 1999). Within these various "people-centered approaches", the specific goals regarding community development and wildlife conservation have varied, along with the conceptual relationship between the two (Adams et al. 2004). Some projects have been considered primarily development projects, with the understanding that natural resource conservation and management is a necessary pre-condition to achieving these development goals. Conservation projects with the

corollary approach also exist, where a project with conservation goals acknowledges that development of and engagement with local communities is imperative for wildlife conservation success (Adams et al. 2004. Still other projects conceive of the two goals as intertwined and have both conservation and development goals simultaneously, or else do not clearly identify the exact linkage between the two. While the philosophies and goals can vary between projects, these "people-centered" approaches share a focus on both wildlife conservation and local livelihoods.

Over the past 25 years, community-based approaches, such as CBC, have become a major component of many wildlife conservation strategies. CBC has been presented as a "win-win" scenario, as a strategy that can conserve wildlife while simultaneously empowering communities and improving livelihoods (Brooks et al. 2006). However, evidence for long-term success with these approaches has been elusive (Hulme & Murphee 2001). When trying to assess the success of projects that have both conservation and development goals, simply agreeing upon useful and measurable metrics for success can be difficult. And because the lifespan of these projects can be years or decades, it has proven difficult to find adequate longitudinal data that can be used to assess project effectiveness. Good longitudinal data analyzing the social side of these projects has been especially rare (but see Stronza 1999, Stronza 2005, Stronza 2010).

CBNRM

In the early 1990s, the shift towards CBC approaches to managing and protecting wildlife was particularly evident in Southern Africa. A diverse group of stakeholders that included the Botswana and Zimbabwe governments as well as international and local NGOs collaborated to initiate a number of on-the-ground, community-based conservation projects (Mbaiwa 2004). These initial projects varied in location and scope, but all fell under the umbrella of the Community-Based Natural Resource Management (CBNRM) Program. CBNRM scholarship has followed the same trend found in the larger debate between preservation and the CBC or sustainable development model (Mbaiwa et al. 2011). Arguments to include local people in decisions regarding wildlife conservation and potential benefits resonated strongly in Africa, where conventional protected area practices of preservation had been particularly exclusionary and dismissive of local people (Adams & McShane 1992). In Botswana, CBNRM gained support from national policy-makers as well as from an array of international conservation and development donors (Kgathi et al. 2004). The core principle of CBNRM is to devolve power from national government to local communities. The devolution of decision-making authority to communal institutions is theoretically "accompanied by real benefits for local resource users as well as secure rights to land and livelihood, and capacity building for management skills" (Mbaiwa et al. 2011). More specifically, scholars hypothesized two conditions must be met to allow for a community to be effective in sustainably, collectively managing a communal resource: 1) Economic and social benefits derived from the resource must be perceived to exceed costs associated with its management; and, 2) The community must develop effective

management capacity to successfully utilize their decision-making authority (Ostrom et al. 1999). Some have argued these should be considered necessary but not sufficient for a successful CBNRM project; that is, they must be present to achieve success, but their presence alone does not guarantee effective community resource management (Ostrom et al. 1999, Blaikie 2006).

CBNRM has been official policy in the Okavango Delta for almost twenty years, but analysis of success of these programs has been inconclusive. Some scholars have found a lack of acceptable conservation outcomes, while others have critiqued the program's ability to provide benefits to local communities (Blaikie 2006). Many of these CBNRM projects have been running for almost 20 years and, as such, offer an opportunity to assess the impacts they have had over a long time period. While some studies have assessed the social impacts of CBNRM over time (Mbaiwa & Stronza 2011), to date few if any have directly followed up with individual subjects over the course of a CBNRM project's duration.

Addressing the Problem

The goal of this study was to determine how knowledge and attitudes regarding community-based conservation have changed for members of one of Botswana's oldest CBNRM projects, the Sankuyo Tshwarangano Management Trust (STMT). In 1997, a year after the STMT was created, Leslie McNutt (who later became the cofounder of the Botswana Predator Conservation Trust) interviewed 21 community members, asking questions related to the project, such as "What is Community-Based Natural Resource Management designed to do?", and "What costs and benefits do you receive from

wildlife?" In 2013, in collaboration with BPCT, I repeated these interviews with some of the same individuals. I explored Trust members' sense of project ownership and management capacity, their attitudes regarding costs and benefits of wildlife, and their opinions regarding the purpose and success of the Trust. From an economic standpoint, the STMT is considered amongst the most successful and longest-running CBNRM projects in Botswana. But how has this economic success changed villagers' views of CBNRM, wildlife, and connections between the two? This study strives to answer whether the STMT has successfully met Ostrom's (1999) criteria for success: A) Has the program created perceived social and economic benefits that exceed the costs associated with wildlife, and B) Has the community experienced adequate capacity building to allow for effective self-management of resources. More specifically, the following research questions are asked: 1) What do participants believe are the goals of the STMT? 2) What do participants believe are the benefits received from the STMT? 3) What do participants believe are the costs and benefits associated with local wildlife, and how do they perceive these are linked with the STMT? 4) Do participants feel a strong sense of ownership and high level of participation in the STMT?

Showing changes in knowledge and attitudes towards CBNRM and wildlife alone does not prove the success of a CBNRM program. In particular, documenting such changes fails to reveal how natural resources are managed or how conservation is working (or not). While scholars and practitioners often assume that positive attitudes towards wildlife and recognition of benefits will automatically lead to behavioral changes and improved conservation outcomes, this assumption doesn't always hold (Liu et al. 2001). In fact, related work in this region has shown reason to doubt that more positive attitudes towards

wildlife correlate strongly with an increase in conservation ethic or conservation-oriented behaviors (Jacobsen et al. in prep). Measuring conservation outcomes is outside the scope of this paper, but must be considered before a comprehensive analysis of the CBNRM program can be made. For this reason, I focus on how effectively the STMT has achieved the *community development* goals of CBNRM, namely whether benefits derived from natural resources exceed their costs, and whether local communities have gained governance capacity to assume decision-making authority.

Methods

Study Area

I conducted interviews in and around the village of Sankuyo, which is located on the southeastern edge of the Okavango Delta in northwestern Botswana. The Okavango River, which originates in Angola, flows southwest through Namibia's Caprivi Strip and terminates in the Okavango Delta wetland, which at 16,000km^2 is one of the largest inland river deltas in the world (Tlou 1985). Located in the Kalahari Desert, this wetland supports some of the densest and most diverse assemblages of wildlife in Africa, and as such has become a major high-end safari tourism destination. The delta is also a major source of livelihoods for the 120,000 local people who live in the region (CSO 2002). For many residents, traditional livelihoods, such as farming, livestock, hunting, fishing, and gathering have been supplemented or replaced by tourism-related activities as revenues from tourism have grown.

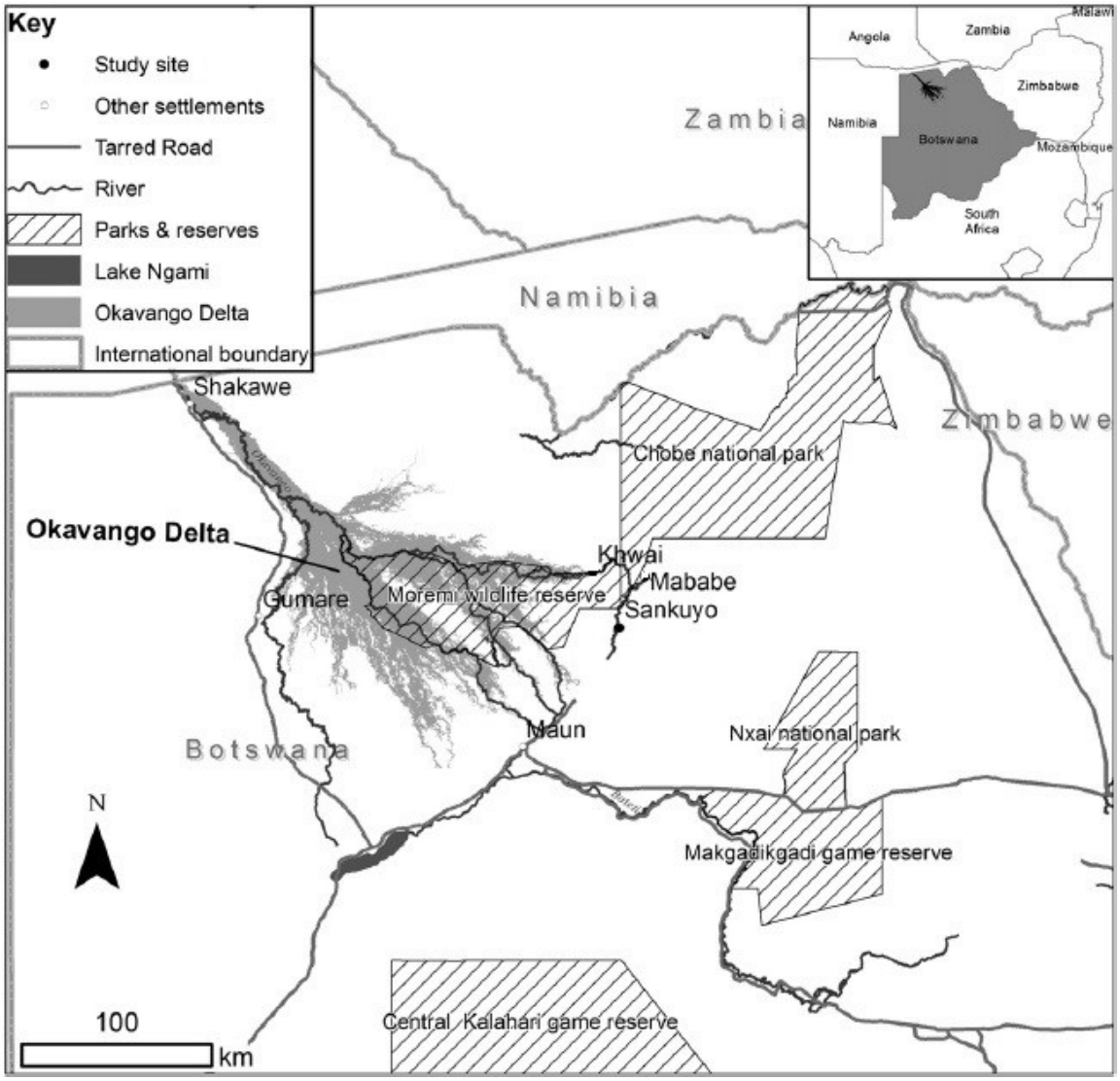

Figure 1: Map of the Okavango Delta Including Sankuyo (altered from Mbaiwa & Stronza 2011)

The village of Sankuyo created the Sankuyo Tsharangano Management Trust (the STMT) in 1996. This project has served as one of Botswana's flagship CBNRM projects since its inception. Sankuyo, with the support of conservation NGOs and the national government, established the STMT to achieve the dual goals of community development

and wildlife conservation. To accomplish this, the government leases the management rights of a wildlife concession area near the village (NG33 and NG34) to the STMT, which has partnered with a number of tourism operators and NGOs on ventures and initiatives. NG 33/34 is located on the edge of the Moremi Game Reserve, and is meant to serve as a buffer between the reserve and livestock management zones located south of the Delta. Since its inception, the STMT has run joint ventures with both a hunting safari operator as well as a photographic safari operator. These joint ventures have created employment opportunities for village residents as well as a consistent revenue stream, which the Trust has used for development initiatives. Some examples of development initiatives include installing standpipes that supply village residents with reliable potable water, building ecofriendly toilets, and purchasing and maintaining vehicles, which are useful for both village residents and tourism activities. Employment opportunities come in two forms. All joint venture partnerships with private companies (hunting and photographic safari operators) included an agreement for hiring village residents for positions in safari operations, such as cooks, drivers, escort guides, etc. In addition, the STMT relies extensively on village residents for paid and unpaid positions to run the Trust directly, including a board that oversees STMT management. The joint ventures have provided a number of indirect development benefits as well, including free meat provided from the trophy hunting operators, and capacity building from training and education programs for village residents participating in STMT activities.

As a CBNRM project, The STMT was created to accomplish wildlife conservation goals concurrently with its development goals. It was designed to achieve these

conservation goals through both direct and indirect methods. Since its establishment in 1996, the Trust has trained and employed a group of community escort guides who are tasked with monitoring local wildlife in their leasehold concession. The escort guides have played a key role as liaisons between the community and the hunting safari partners, by accompanying all trophy hunts conducted in the concession area. While the escort guides practice opportunistic monitoring when possible, they have not been required to perform regular, systematic monitoring of wildlife populations in NG 33/34 to date. In the absence of this legal obligation, there has been a lack of commitment to any substantive monitoring or evaluation. In addition to direct monitoring, the STMT was also intended to achieve conservation more indirectly, as a result of the employment and resources provided to community members. However, as noted above, the conservation successes of the STMT may or may not correlate with development measures.

Data Collection

The initial interviews were conducted by Leslie McNutt in 1997 in the village of Sankuyo. As part of a Master's thesis investigating local attitudes and consequent behaviors towards predators and conservation in the eastern Okavango Delta, initially 21 respondents were interviewed using purposive sampling, with the goal of selecting a representative slice of members of the Sankuyo community. Purposive sampling is used when the researcher has a specific purpose they want participants to serve, and selects specific individuals to achieve that goal (Bernard 2000). After extensive participation in the STMT formation and management activities, Ms. McNutt chose 21 individuals that would represent a wide range

of ages, education, and participation levels in the STMT. A range of open ended questions were asked relating to CBNRM and its implementation, such as what does CBNRM mean, what is the function of the Trust, and what kind of costs and benefits are anticipated or received from wildlife and from the CBNRM Program.

In 2013, I re-interviewed many of the same participants interviewed in 1997 to evaluate how residents' answers had changed following 16 years of participation in CBNRM. Sankuyo's CBNRM initiative has been operating uninterrupted during the 16-year span and has often been highlighted in various public media and CBNRM reviews as an example of successful community-based conservation. Of the 21 respondents from 1997, 18 were still alive in 2013. Fifteen of the 18 respondents were interviewed following the same interview format used in 1997, with two additional questions not originally included. The interview consisted of nine demographic/employment questions and 17 open-ended questions. The full list of interview questions is included in Appendix A.

For both interview sets, interviews were conducted at the respondents' homes in Sankuyo village or at their place of employment (when employed by the STMT). Each interview lasted between 40-60 minutes, depending on the individual. All interviews were conducted in Setswana (a national language of Botswana) and translated by a field assistant fluent in English and Setswana who was from the local area.

The second interviews were conducted in the midst of a significant transition for the STMT and for wildlife management in the entire country. The year 2013 was the last season trophy hunting was conducted by the STMT in NG 33/34, as Botswana adopted a country-wide trophy hunting ban in 2014. Before the ban, the Trust had participated in both

photographic tourism and trophy hunting in concert to maximize benefits for the community. While there were plans in place to expand photographic tourism involvement following the hunting ban, community members were worried the STMT would become less profitable and successful, as trophy hunting had always provided the greatest revenue as well as other irreplaceable benefits (such as free meat for community members). For this reason, I added a question in 2013 specifically about the hunting ban.

Data were analyzed using thematic analysis (King 2004). The relevance of the data comes not from the sample size, but rather from the opportunity to follow a group of specific people over this time period. Therefore, the patterns and answers reported are not meant to be representative of a larger group, but rather illustrative of changes that have occurred in these participants' lives, perceptions, and opinions over the course of the STMT's existence. For this reason, I focus primarily on differences between 1997 and 2013 responses rather than on patterns found within either year.

Results and Discussion

Interviewees

Of the 21 people interviewed in 1997, 15 were re-interviewed in 2013. Six of these 15 were men and nine were women. Seven were between 18 and 30 years old as of the 1997 interviews, while the other eight were over 30 (the oldest being 62 in 1997). In 1997, only two were employed by the STMT, and none held jobs in wildlife tourism. In 2013, five respondents were employed by the trust at the time of the interviews, and three were

currently employed in tourism jobs not related to the STMT. Notably, in 2013 all 15 respondents had either been employed by the STMT directly or had an immediate family member work for the STMT during its 16 years of operation. This is illustrative of the level of involvement of the community overall; in a small village like Sankuyo, almost all residents had regular exposure to generated income from the Trust, and had significant involvement in various aspects of the Trust, over its lifespan.

1) What are the goals of the STMT?

The first questions in the interview investigated the level of respondents' understanding of the STMT, asking about the definition of CBNRM and the purpose of the Sankuyo project. The number of participants who identified the community development and poverty alleviation goals of the trust increased from 10/15 in 1997 to 14/15 in 2013. Comparatively, there was a lower recognition of wildlife conservation goals associated with the project; zero of 15 mentioned these in 1997 and only two of 15 mentioned them in 2013. While I am not assessing the conservation outcomes of the STMT in this paper, this lack of acknowledgement of conservation goals is concerning. However, this does not mean respondents didn't recognize the importance of wildlife or perceive benefits from it (see below), just that they did not perceive wildlife conservation to be a primary purpose of the STMT.

A male participant (who was in 70s during the second interview) admitted he did not know the purpose of the STMT when asked in 1997. In 2013 he responded that "I've never myself worked for the Trust, but I've learned from my children that it is to help with poverty

in the village. My son was employed by the trust, and I received a pension." Another participant, who was employed as a safari guide at the time of the second interview, was one of two who identified the wildlife conservation goals of CBNRM. He explained why his answer was unusual. "I work with tourists every day and I see how they feel about wildlife. But most people just stay in the village, or work at the campsite. So for them, the Trust is meant for creating jobs and providing development."

2) What are the benefits received from the STMT?

When asked what impact the Trust had on the community as a whole, eight of 15 reported the STMT was having a positive effect on the village in 1997 (with the rest reporting no effect); in 2013, the number reporting a positive effect had risen to 15/15. This trend was mirrored by the responses to whether participants received benefits personally from the Trust. Participants who reported benefits from the Trust increased from 12 to 14. The variety and amount of these benefits were also reported as higher during the second interviews. In 1997, the most common benefits listed were water standpipes and training. By 2013 benefits reported included pensions for seniors, free meat from the trophy hunting venture, access to transportation from the Trust vehicle, and direct employment. This increase in reported benefits is due to the increase in employment opportunities and development projects, as well as an increase in the knowledge of and engagement in the community over this period. A 43-year-old (at the time of the second interview) female participant reported receiving no direct or indirect benefits in 1997. When asked the same question in 2013, she listed toilets, standpipes, and the pension paid to her parents as

direct benefits, and mentioned a management training course the STMT had paid for her to attend as an important indirect benefit. While she was not employed by the trust in 2013, she had previously served on the board for several years, and remained an active participant in community meetings regarding Trust activities. She also had several family members working with either the Trust or the joint venture partners.

3) What are the benefits and costs of local wildlife?

The biggest change between the two interviews is found in the answer to the question "What are the benefits to you of wildlife?" Between 1997 and 2013, the number of people who answered no benefits at all to this question went from 10/15 to 0/15. When combined with the previous answers regarding benefits from the STMT, I see an increase in the perceived link between wildlife and a successful Trust (Table 1). The specific language used supports this conclusion as well. One 46-year-old (at the time of the second interview) male respondent answered simply "I receive no benefits from wildlife" when asked in 1997. In 2013, the answer contrasted sharply: "Sure, we receive great benefits from wildlife. With the quota we receive for safari hunting, we make money to pay wages, support the community pension fund, and pay for community projects like installing water taps." He was serving on the STMT board of trustees in 2013 when interviewed. Another respondent, a 78-year-old woman who had never worked a salary job, gave a similar answer despite having never worked for the STMT directly. "I get a lot from hunting, including meat and a pension." These answers are typical of 2013 responses.

	1997	2013
Respondents Reporting Benefits (Direct or Indirect) from STMT	12/15	14/15
Respondents Reporting Benefits from Wildlife	5/15	15/15

Table 1: Connecting the STMT to Wildlife

Conversely, answers to the question "What are the problems from wildlife" changed little in the two interviews. In fact, the number of respondents who reported elephants raiding crops to be a problem increased slightly, from 13/15 in 1997 to 15/15 in 2013. Even the 2013 Trust board chairman acknowledged that there were problems with human-animal conflict. "Elephants are definitely the biggest problems because they raid crops, but lions and hyenas can also create problems by killing livestock."

In 1997, only one of 15 participants believed that the benefits from wildlife outweighed the costs associated with them. This had completely flipped in 2013, with all fifteen believing the benefits from wildlife were equal to or greater their costs. While the perceived benefits from wildlife exceeded their perceived costs for nearly all respondents in 2013, 13 of 15 did not view wildlife conservation as a *goal* of the program, but rather as a necessary component that will help achieve the social goals of poverty alleviation and community development. For conservation NGO's and government programs with explicit conservation goals, this is an important distinction.

4) Do participants feel a strong sense of ownership in the STMT?

When answering questions regarding how the Trust was managed and by whom, respondents were more knowledgeable and optimistic in the 2013 interviews. In 1997, seven respondents of 15 did not know who managed the Trust, and only four believed it was managed by the community as a whole (as it is designed to be). In 2013, 14 out of 15 believed decision-making was carried out by the entire community. This is likely because by 2013 everyone interviewed had either served on the board of the Trust themselves or had a close family member who had been on the board. A woman whose daughter was currently serving on the board answered "the membership as a whole makes all the big decisions, and hires or elects people to fill the leadership positions."

There was another, more subtle change in the interviews regarding respondents' sense of ownership. In the 2013, it was common for respondents to use possessive pronouns when discussing various aspects of the project and concession ("our trust", "our concession", "our quota"). This type of language was almost completely absent in 1997 responses. A woman who had never worked directly for the STMT, when asked if the CBNRM project in Sankuyo was as success, answered "Yes, our Trust has been very successful. The only problem is that sometimes, there are a few individuals who try to get more than their share, which can cause problems for us."

Overall Trends and Lessons

When considering the interviews as a whole, several trends are apparent regarding changes between the respondents in 1997 and 2013. Firstly, participants had more positive

views across all questions in the follow-up interviews. In the second interview, most respondents reported receiving direct and indirect benefits from the STMT, and almost all associated these benefits with the wildlife found in their concession, compared to a more mixed response in 1997. Though respondents acknowledged a variety of problems, it was clear most considered the project a success overall. This is worth noting, even if unsurprising. Through 16 years, almost all community members have actively participated in the project at some point, and almost half of respondents were actively participating (either as board members or employees) at the time of the second interview. While overall perceptions of benefits derived from such a project alone do not prove the project's overall goals have been reached, positive perceptions are at least fundamental to any community conservation effort.

Another overall trend is an increase in the knowledge regarding all aspects of the project, as well as an increase in the *sophistication* of language used to communicate that knowledge. Respondents didn't simply know more about their project in 2013; they had learned how to use more detailed and elaborate descriptions to answer the questions as well. This change can most likely be attributable to a variety of factors. An increase in education generally and environmental education specifically may be a reason, as well as years of community management meetings where project details are debated and voted upon. Another likely factor is the community's repeated exposure to researchers. Because of Sankuyo's location and status as a flagship CBNRM project, it has been the location for numerous studies over the life of the project, many of which involved interviewing a

significant number of residents (including this study; see also Parry & Campbell 1992, Mbaiwa & Darkoh 2009, Kgathi et al. 2004).

An example of this increase in sophistication can be found in responses to the question "Is there a decline or an increase in wildlife numbers over the past ten years? What is the cause?" The answers and reported causes varied for both interviews, and as such the results are not useful for documenting wildlife population trends. However, I can detect a difference in the *way* respondents discussed these trends. One woman, in 1997, answered "animal numbers are increasing because of breeding." In 2013, her answer was the same, but the explanation was more complex: "Wildlife has been increasing because in the concession, hunting and photographic safaris are separated, and hunting only occurs for six months using a strict quota." In 1997 she was unemployed and recently finished with school. In 2013, she had been working as a chef's assistant at the safari lodge run with their joint venture partners, where she had been working for over four years. She would spend two months working at the lodge followed by a month off when she stayed in Sankuyo. While she hadn't received any formal training in conservation or tourism management, her exposure through her job as well as participation in community meetings could have led to this increase in detail and precision of language.

Another example comes from a 58-year old woman who in 2013 spent the majority of her time selling souvenirs in Maun (the largest town in the region, located ~100km south of Sankuyo). In 1997, she was living in Sankuyo and unemployed. When asked what benefits she receives from wildlife, she responded "I don't receive any benefits", even though she was living in Sankuyo and had a family member working for the STMT. In 2013, she

answered the same question “Wildlife is very important because it brings in tourism and creates jobs. Even though I stay in Maun, my relatives are getting money, which benefits me because relatives take care of each other.” Even though she was further removed from the project and from direct benefits, she was more aware and articulate about indirect benefits she and others received due to wildlife.

When it comes to assessing the validity of responses, I would argue this increased sophistication can be seen as a double-edged sword. On one hand, respondents can use this more nuanced understanding of their project and related environmental issues in their community to provide more precise and informative responses; on the other, respondents could be more sophisticated in regards to giving answers they believe interviewers “want to hear” in order to increase future investment and support for the project. While this problem is of legitimate concern, I hope that my significant presence in the community conducting ethnographic research combined with the research assistants (who were well-known in the community) mitigated this threat to validity.

Views on Trophy Hunting and Poaching

The above quote (“Wildlife has been increasing because in the concession, hunting and photographic safaris are separated, and hunting only occurs for six months using a strict quota”) also leads to another theme that emerged from the 2013 interviews. The 1997 interview did not include any questions directly regarding trophy hunting or poaching, and as such they rarely came up. However, in 2013, poaching was brought up repeatedly, even when answering questions not directly related, in order to highlight how the community

was doing a good job managing their concession and to say poaching was not happening. The following insight from the 46-year old male board member quoted previously was typical: “The Trust is managing wildlife well because the only hunting is for trophy hunting and only done in the hunting season. No one is poaching without permission.” An older woman who hadn’t worked formally for the STMT had a similar response: “I believe the Trust is managing the animals because no one can just go hunt for themselves. It is working because there have been no poaching incidents.” These were two of several responses in 2013 to stress the community does not illegally hunt any animals in their concession, even though there are no questions that specifically deal with poaching. This is likely because the community has learned the strong negative response poaching of wildlife triggers among conservation NGOs, researchers, and other people they have come to depend on for the STMT to continue. This is one of the biggest differences detected by conducting long-term ethnographic research compared to data from initial interviews. After spending enough time in the village, some Sankuyo residents would admit that villagers did occasionally hunt some small game (never large “tourist” species such as giraffe, elephant, etc.) for food. But if, during a formal interview, a question was asked about “poaching,” answers were universally negative and condemned the practice. It seems clear respondents have learned this is a trigger word that can be used with conservation practitioners to garner support and sympathy.

I also suspect that villagers were eager to bring up hunting in part because at the time of the second group of interviews, Botswana was in the process of enacting a country-wide ban on trophy hunting. The STMT had relied on trophy hunting for a large percentage

of its income since the Trust was established in 1996; 2013 was to be the final year before a complete shift to photographic tourism. For this reason, I added a question asking how villagers felt about the hunting ban to the 2013 interview. Predictably, all 15 respondents were strongly opposed to the ban. They considered the free meat provided from safari hunting along with the revenue and employment generated to be amongst the most important benefits the STMT provided to the community. In addition, most respondents were worried the end of hunting would lead to an increase in problem animals near the village (elephants raiding crops and predators raiding livestock and threatening people). It will be important to monitor how this ban impacts the Trust in the coming years, and these and other data can help provide a baseline to help measure those changes.

Conclusion

The CBNRM Program in Botswana was created with the goal of devolving power of natural resource management to local communities. The program operates under the assumption that local communities need to meet two objectives as necessary preconditions of success. First, they must develop adequate capacity to manage their natural resources. Second, community members must perceive natural resources as providing economic and/or social benefits that exceed the costs of managing them. While achieving these two criteria alone does not guarantee success, any assessment of CBNRM must consider them. While these data reported in this paper are too limited by themselves to serve as a comprehensive assessment of the STMT, they can be combined with results from related studies to explore to what extent these conditions have been met.

In regards to capacity management, this paper has reported an increase in awareness relating to wildlife and community development goals, as well as an increased sense of ownership from community members over the project and the concession area. Most community members participated directly in the STMT over the 17 years of the project's lifespan, with some receiving formal training in management, wildlife monitoring, and other relevant skills. This participation and training led to increased knowledge and sophistication when discussing wildlife and Trust management. While these trends support the idea of an increase in project management capacity amongst community members, solid evidence to support associated improvement in wildlife management practice is still to be determined. While this capacity building trend is encouraging, I argue it needs to continue for Sankuyo to be able to reach the capacity level envisioned by CBNRM creators. This is especially relevant as the STMT transitions from a trophy hunting model to more actively managing various photographic tourism components. Whether Sankuyo has sufficient ownership as reflected by decision-making authority as compared to regional and national governments and other stakeholders merits discussion and analysis but is beyond the scope of this paper.

I recorded a slight increase in direct and indirect development benefits from the STMT reported by community members, with all respondents identifying benefits received from local wildlife in the second interviews. These reported economic and development benefits match economic benefits found in other studies conducted in Sankuyo (Arntzen et al. 2007). Connected to these benefits, I also reported an increase in positive attitudes towards conservation and towards the Trust. These findings of positive attitudes towards

conservation and wildlife tourism support similar findings from related studies in Sankuyo and surrounding CBNRM projects (Mbaiwa 2007). When the increases in capacity, economic benefits, and positive attitudes towards wildlife are combined, it is clear that the STMT has made important strides towards achieving the community development goals of CBNRM.

However, there are also some important lessons for outside agencies that view CBNRM and similar community-based projects as primarily wildlife conservation tools. While I have seen an increase in awareness of benefits from local wildlife in Sankuyo residents, they still almost universally view the STMT as a mechanism for community development and poverty alleviation rather than for wildlife conservation. When this priority is combined with CBNRM's commitment to building capacity and empowering local communities, there is the potential for conflicts of interest with funding institutions with primarily conservation goals. If forced to prioritize between conservation and community development, it shouldn't be surprising if the community chooses the latter. In addition, if conditions changed so that wildlife is no longer perceived to bring significant benefits, it is possible that community support for conservation activities could erode. But while this is worth noting, it does not diminish the community development achievements of the Sankuyo Tshwarangano Management Trust over its 16 years of operation.

CHAPTER III

UNDERSTANDING IMPACTS OF LIVELIHOODS ON ATTITUDES AND TOLERANCE OF WILDLIFE: A COMPARATIVE CASE-STUDY

Introduction

In certain contexts, conspicuous wildlife species can provide significant benefits for local people, most commonly as the result of wildlife tourism. In other situations, however, these same wildlife species can cause substantial costs in the form of crop raiding or livestock depredations, as well as indirect costs like stress and fear over safety and livelihood security. When costs overwhelm perceived benefits, then conflict between humans and wildlife often arise. This human-wildlife conflict (HWC) can negatively impact both wildlife conservation and the livelihoods of local people (Woodroffe et al. 2005, Naughton-Treves et al. 1998). Large-bodied, mammalian carnivores are particularly predisposed to conflict with people, usually through the depredation of livestock or, more rarely, direct attacks on humans (Inskip & Zimmerman 2009). This predisposition is due to these predators' large home ranges and dietary requirements (Macdonald & Sillero-Zubiri 2002). Elephants also present unique challenges in their interactions with humans. Because of their size and behavior, they are often seen as dangerous and destructive agricultural pests (Dublin & Hoare 2004). In response to livestock predation by carnivores and crop raiding by elephants, local people often resort to lethal methods of control. Lethal control has been a key factor in the decline of wildlife species across the globe, and particularly in Africa for species such as lion (*Panthera leo)*, cheetah (*Acinonyx jubatus)*, and African wild

dog (*Lycaon pictus)* (Frank et al. 2006, Marker & Dickman 2004, Gusset et al. 2009). The conflict seems to be increasing in frequency across much of the world, as more conservation areas are established, thus limiting areas for agricultural or livestock production, and as human settlements expand in rural areas (Treves & Karanth 2003, Robbins et al. 2007). These trends are intensifying human-wildlife conflict, particularly at the boundaries of conservation territories and agricultural production (Zimmerer 2006).

Human-Wildlife Conflict

In response to the trend of increasing conflict, conservation scholars have increased the number of papers and studies focused on HWC in the last decade (Dickman 2010). In an effort to minimize and mitigate conflict, scholars have focused on different aspects of human-wildlife interactions. One approach is to analyze the ecological patterns of livestock predation and crop raiding to predict where conflict is most likely to occur (Hemson et al. 2009). For example, studies of predators have looked at factors such as prey preferences, habitat type, and husbandry practices to find predictors of increased predation risk (Marker et al. 2003, Treves et al. 2004). Similarly, Naughton-Treves et al. (1998) used crop-loss data to show what factors best predict crop raiding by elephants and other species. Once these predictors are identified, scholars focus on a variety of technical approaches to help reduce the conflict (Woodroffe et al. 2005). These strategies include physical barriers such as fences, as well as behavior modification such as use of chilies to deter elephants, and taste aversion conditioning in predators (Davies et al. 2011, Ternent & Garshelis 1999, Songhurst et al. 2015). Other strategies include non-lethal control of problem species and promoting

strong animal husbandry practices (Breitenmoser et al. 2005). These techniques can undoubtedly help to lessen conflict in certain conditions. However, scholars have realized there can be a non-linear relationship between damage done by wildlife species, and the attitudes and behaviors of people towards them (Dickman 2010).

For this reason, another focus of HWC has been on the attitudes and behaviors of local people towards wildlife. These studies can be descriptive, designed to understand how local people feel about problem species before the implementation of a new management policy or conservation project (Oli et al. 1994, Lindsey et al. 2005, Kellert 1985). Many studies have examined attitudes towards wolves and other species in North America (see Williams et al. 2002 for a review of 38 studies), but there have also been smaller number of such studies focused on African species (Lindsey et al. 2005, Rodriguez 2008, Hill 1998). Data sets regarding attitudes towards wildlife have been used to test for correlations between variables such as income level or education (Kaltenborn et al. 1999, Williams et al. 2002), or more rarely to test for differences in attitudes across time or space (Naughton-Treves et al. 2003, Hemson et al. 2009).

Underlying these ecological studies, as well as those focused on attitudes, is the assumption that there is a connection between the costs inflicted by predators on local people, and those peoples' attitudes and ultimately their behaviors towards the predators. But these connections are not always straightforward, and can lead to complications in achieving conservation (Dickman 2010). Variations in local people's attitudes towards wildlife are due not just to the perceived costs and benefits derived from them, but also from more deeply engrained cultural biases towards them (Kellert 1985). In addition, some

studies have shown a disconnect between people's attitudes towards wildlife and their behaviors towards them (Liu et al. 2011).

Addressing the Problem

In an attempt to disentangle these complex relationships between costs and benefits of wildlife and people's attitudes and behaviors towards them, I conducted interviews with local people living in two neighboring villages on opposite sides of the wildlife-livestock boundary in rural Botswana. I used a comparative case-study approach, contrasting the attitudes towards and tolerance of wildlife reported by people from communities who have a similar cultural background but different costs and benefits associated with wildlife. By comparing attitudes and tolerance both within and between the two communities, I measured distinctions and relationships between different social variables. I focused primarily on two species: Lion (*Panthera leo*) and African elephant (*Loxodonta africana*). These species were chosen because they have been documented causing significant financial damage in the area (Gusset et al. 2009), and because they were identified by local farmers as the biggest problem animals in preliminary research (Jacobsen unpublished data). Both species are simultaneously amongst the biggest draws for safari tourists on the wildlife side of the boundary. In addition to lions and elephants, I also report attitudes towards spotted hyena (*Crocuta crocuta*) in the first results section, to offer a comparison to another predator species associated with high costs to livestock, but less associated with tourism benefits. I did not collect tolerance data for spotted hyena, so the following sections focus solely on lions and elephants.

Methods

Study Site

I conducted interviews in and around the villages of Shorobe and Sankuyo, both located in the Okavango Delta area in northwestern Botswana. The Okavango Delta, at 16,000 km^2, is one of the largest inland deltas in the world. Because the delta is located in the heart of the Kalahari Desert, it serves as an important water source for a wide variety of African fauna (Tlou 1985). This density and diversity of wildlife, along with the picturesque delta setting, has led to the delta becoming one of the most popular high-end wildlife safari destinations in Africa. The delta is also a major source of livelihoods for the 120,000 local people who live in the region (CSO 2002). For some residents, traditional livelihoods such as farming, livestock, hunting, fishing, and gathering have been supplemented or replaced by tourism-related activities as revenues from tourism have grown.

The villages of Shorobe and Sankuyo are located on the southeastern edge of the Okavango Delta, and are around 50km apart. They are similar in size and ethnic makeup, but have been separated by the Southern Buffalo Fence since 1982. The fence is part of a country-wide fencing strategy, which was initially designed to combat the spread of foot-and-mouth disease from wild buffalo populations (where the disease is endemic) to livestock. These fences have also become the political boundaries that demarcate the separation of wildlife tourism and conservation areas from livestock and agricultural lands. Before the fence was installed, both Sankuyo and Shorobe relied primarily on subsistence livelihoods such as farming, livestock, hunting, and fishing. Following the fence's

installation, keeping cattle became illegal in Sankuyo but continued in Shorobe. As an alternative to livestock, (as part of the Community-Based Natural Resource Management (CBNRM) initiative), the people of Sankuyo were given the authority to manage their land for wildlife while partnering with tourism and hunting safari operators to gain direct economic and development benefits (Mbaiwa et al. 2011). The village of Shorobe, however, was designated as outside the wildlife management zone, and therefore not able to benefit directly from tourism. Livestock production and farming continued and remains the primary livelihood option for residents there.

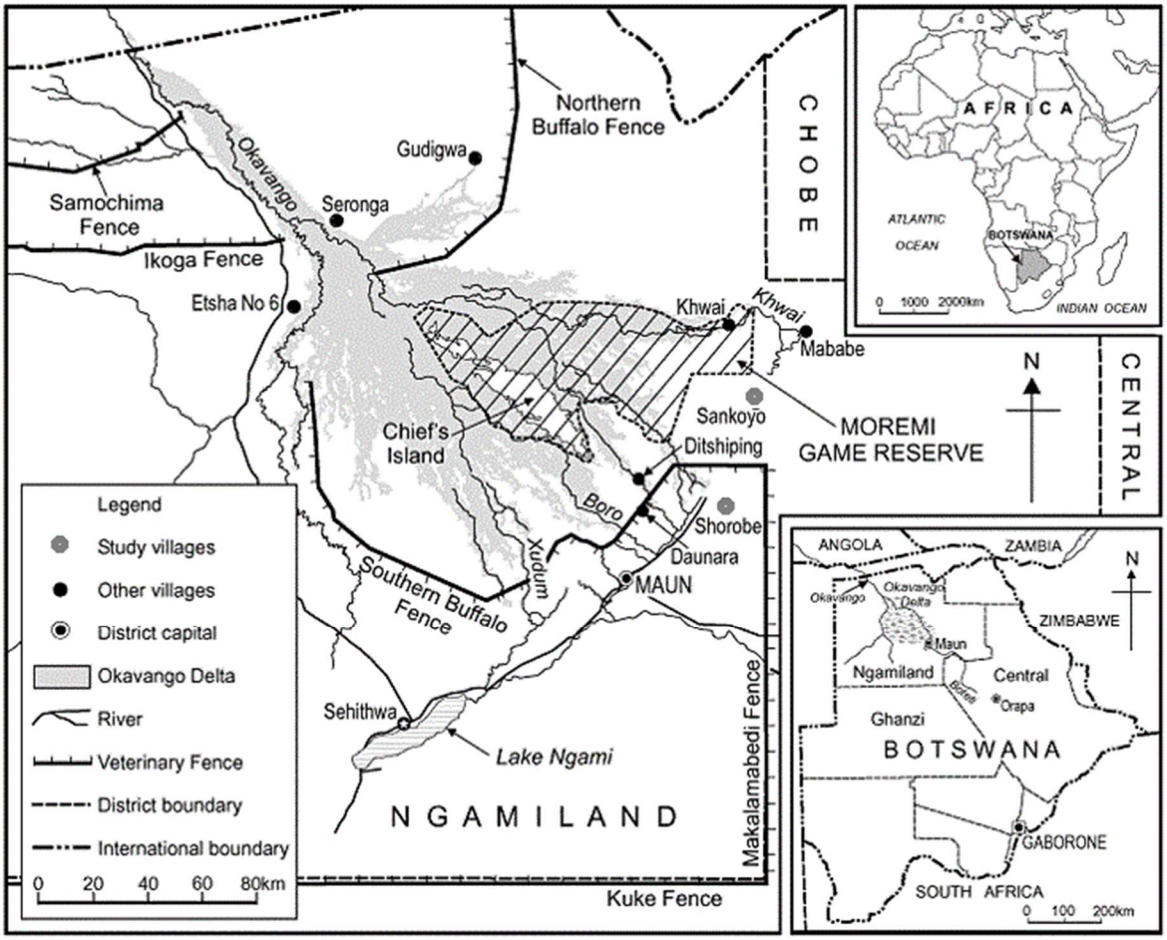

Figure 2: Map of the Okavango Delta including Shorobe and Sankuyo (altered from Mbaiwa et al. 2008)

Interview Design

I conducted a total of 156 interviews, 90 with Shorobe residents and 66 with Sankuyo residents, in 2012-2013. These interviews were designed to measure two primary dependent variables: attitudes towards lions/elephants and tolerance of lions/elephants. Interviews consisted of 35 questions, which were broken into four sections. The first group asked demographics questions (age, gender, ethnic group, and income source). The second were questions related to costs and benefits derived from wildlife, documenting

respondents' home village, level of involvement in the wildlife tourism industry, number of cattle owned, and livestock losses due to wildlife. To distill benefits from tourism, I created an "index of tourism involvement," which combined current employment, past employment, family involvement, and direct interaction with tourism activities into a single index variable. The third group were questions measuring the first dependent variable: attitudes towards wildlife. To measure attitudes, I used a five level Likert scale, asking "How do you feel about lions/elephants/spotted hyenas?" Possible answers were given as very negative, negative, neutral, positive, or very positive (answers were coded 1-5). I followed by asking why they answered as they did. To complement these Likert scale questions, I included several dichotomous yes/no questions including "would your life be better if there were no lions in this area" and "are lions good for [your village]?" Lastly, the fourth group of questions was designed to measure the second dependent variable: tolerance level for lions and elephants. Following Naughton-Treves et al. (2003), I designed a series of questions to serve as a proxy measure of people's tolerance for living near lions and elephants. These questions gave different scenarios and asked if killing the species in question was appropriate. For lions, I asked 1) "should all lions be killed," 2) "If a lion is near a cattle post, should it be killed," 3) "If a lion has killed one cow, should it be killed," and 4) "If a lion has killed 10 cows, should it be killed?" For elephants, I used three scenarios, asking 1) "should all elephants be killed," 2) "if an elephant is near a crop field, should it be killed," and 3) "if an elephant has raided someone's crops, should it be killed?" A tolerance level was determined based on the threshold for killing each species (coded as 1-5 for lions, 1-4 for elephants).

Interview Administration

In Shorobe, I conducted most interviews at cattle posts, with people who spent the majority of their time caring for livestock and crops. Cattle posts are designated livestock plots located on Shorobe's communal land, which directly surrounds the village. Each cattle post had between 15 and 800 cattle (most were between 30 and 200), and many also have subsistence crops (such as maize, sorghum, or millet) in the appropriate season. I targeted the heads of each cattle post (who could be male or female), which is not an official designation but I defined as the individual who lived primarily at the cattle post and was most responsible for daily care of cattle. I successfully interviewed heads of 60 out of 67 Shorobe cattle posts. In addition to these interviews, I also conducted an additional 30 interviews using a convenience-based sampling approach in Shorobe village proper. These additional interviews were used in regressions for the combined sample of all residents in order to test for correlations between independent variables and attitudes and tolerance.

In Sankuyo, where there are no cattle posts, I prioritized interviews with heads of households (HOH), who could be male or female. I interviewed 44 of the 49 Sankuyo HOH. I complemented these interviews with an additional 22 interviews, selected using a convenience-based sampling approach (stratified by neighborhood). With these data, I attempt to answer the following three questions:

1) What are the reported attitudes towards lions, spotted hyena, and elephants for residents of Shorobe and Sankuyo villages?

To answer this question, I use simple descriptive statistics, comparing the distributions and averages of the reported attitudes towards three species (lions, elephants, spotted hyenas) for Shorobe and Sankuyo residents.

2) How do four independent variables (gender, age, cattle ownership, and tourism index) correlate with four dependent variables (attitudes towards lions, attitudes towards elephants, tolerance of lions, tolerance of elephants)?

To perform this analysis, I performed multiple linear regression across the combined sample of Sankuyo and Shorobe residents. All four independent variables (gender, age, cattle ownership, and tourism index) were reported as categorical variables. I measured age (18-40, 41-60, 60+) and cattle ownership (0, 1-10, 11+) as categorical because in both cases, many respondents were unsure on the precise number. Many older respondents did not know their exact age, and some respondents with relatively large numbers of cattle were not exactly sure how many were owned.

Following Zimmerman et al. (2005), I treat the Likert scale dependent variables as continuous, and use multiple linear regression to test for correlation between the categorical independent variables (gender, age, cattle ownership, and tourism index) and the dependent variables (attitude toward lions, attitude towards elephants, tolerance of lions, tolerance of elephants). Because using dummy variables in this way maximizes the potential for type 1 error, I report significance at both the $p<0.05$ and $p<0.01$ level, and focus on those that reach the stronger significance level.

3) How do attitudes and tolerance differ between Shorobe and Sankuyo villages? Are differences stronger for one than the other?

After demonstrating a strong association between home village and costs and benefits from lions and elephants, I focused on a direct comparison between the two groups. Chi square tests were used to measure differences between the two villages for all four dependent variables (attitudes towards lions/elephants, tolerance of lions/elephants).

I acknowledge that this study is not a controlled experiment, as I do not have replication and there was not accounting for differences between the two villages. Therefore, statistical inferences are necessarily weak. Nonetheless, the comparative case-study approach provides information that contributes to our general understanding of how the costs and benefits of wildlife impacts attitudes and behaviors towards them.

Results

Attitudes Towards Lions, Spotted Hyenas, and Elephants

Unsurprisingly, Shorobe residents reported largely negative attitudes towards lions, spotted hyenas, and elephants. When comparing attitudes towards the three species, there was not a strong difference between each species. Overall, the average attitude (where 1.0=very negative, 3.0=neutral, 5.0=very positive) towards lions was 2.07, compared to 1.84 for spotted hyenas and 1.86 for elephants. Table 1 shows the full breakdown of answers for each species.

	V. Negative	Negative	Neutral	Positive	V. Positive	Average
Lions	23.3%	45.6%	18.9%	12.2%	0%	2.2
Spotted Hyenas	36.7%	40.0%	12.2%	11.4%	0%	2.0
Elephants	44.4%	26.7%	14.4%	13.3%	1.1%	2.0

Table 2: Attitudes of Shorobe residents towards wildlife (n=90)

As Table 2 shows, most residents reported negative or very negative attitudes for all three species. When asked why, the most common answer for negative responses were related to livestock depredations (lions and spotted hyenas) and crop raiding (elephants). For lions and hyenas, the next most common answer was the danger posed to people. One farmer claimed that "lions and hyenas are killing all our livestock; not only that, they can even attack human beings." Three residents explicitly cited the lack of tourism benefits as their primary reason for disliking all three species. "We get nothing from safaris, so why should we like these animals?" Of the minority who had positive attitudes, answers to why split between benefits from tourism and lack of problems caused by the animals in question. A woman whose farm was located far from the fence explained "elephants don't bother us too much this side, so I don't mind."

Sankuyo residents reported attitudes that were more mixed for all three species. The average attitudes for lions was slightly positive at 3.12, with slightly more negative averages reported for spotted hyenas (2.97) and elephants (2.61). Table 3 shows the full distribution of answers for all three species.

	V. Negative	Negative	Neutral	Positive	V. Positive	Average
Lions	12.1%	21.2%	25.8%	24.2%	16.7%	3.12
Spotted Hyenas	16.7%	21.2%	25.8%	21.2%	15.2%	2.97
Elephants	19.7%	25.8%	31.8%	15.2%	7.5%	2.61

Table 3: Attitudes of Sankuyo residents towards wildlife (n=66)

Reported attitudes were fairly evenly distributed across all answers for all three species, and the most common response for all species was a neutral attitude. This pattern was reflected in answers to why respondents held those attitudes. The most common response was to highlight the simultaneous costs and benefits received as a result of these species. One middle-aged woman who worked in the local elementary school reported a positive attitude towards lions, and explained "we cannot live without wildlife. Lions do cause problems, but they bring money that outweigh them." For those who responded positively, the overwhelming reason given was that the animals bring tourists. One 80-year-old woman who had never worked in tourism herself said that "the real reason people come on safari is because of lions. My children make money and support me because of them." For those with negative attitudes towards lions and hyenas, the most common reason given was danger to livestock and people. A woman who worked in the village clinic explained that "lions do cause us problems, but not as much as they do for people with cattle."

Attitudes towards elephants were mixed as well but did skew slightly more negative than for the predators. The biggest reason cited for these negative attitudes was crop raiding. Many respondents expressed that even if elephants did bring benefits, there were

too many and needed to be controlled. “There are far too many, they destroy all the crops” answered a retired hunting camp attendant. This is notable because elephants were the largest earner for the community’s hunting safari partnership run by the STMT; elephants accounted for more profit and more free meat for the STMT than any other species (lions and hyenas were not hunted at all).

Multiple Regression of Joint Shorobe/Sankuyo Sample

I performed a multiple linear regression across the combined sample (n=156) to assess the relationship between attitudes and tolerance of lions and elephants and four resident characteristics. These characteristics (which are all categorical) were gender, age (18-40, 41-60, 61+), cattle ownership (0, 1-10, 11+), and tourism index. Tourism index was developed to try to capture how closely each resident was associated with the tourism industry, and was coded as follows: 1) currently employed, 2) formerly employed, 3) family members are employed 4) none of the above. The results are shown in Tables 4 and 5.

	Attitude toward Lions		Attitude towards Elephants	
Resident Characteristics (df=8)	F=4.94 p<0.01 N=150		F=5.55 p<0.01 N=150	
	Coefficient	***SE***	***Coefficient***	***SE***
Gender				
Female	0.11	0.17	-0.04	0.18
Male (reference)	--	--	--	--
Age				
18-40	0.59**	0.22	1.01**	0.22
41-60	0.16	0.23	0.06	0.23
61+ (reference)	--	--	--	--
Cattle Owned				
None	0.53**	0.2	0.40*	0.2
1-10	0.42	0.26	0.11	0.27
11+ (reference)	--	--	--	--
Relationship to Tourism Industry				
Currently Employed	1.31**	0.33	0.75*	0.33
Formerly Employed	0.26	0.26	0.18	0.26
Family Member(s) Employed	0.08	0.22	-0.13	0.22
None of the Above (reference)	--	--	--	--

Table 4: The relationship between attitudes towards lions/elephants, and resident characteristics, expressed as coefficients. * indicates p<0.05, ** indicates p<0.01

	Tolerance of Lions		Tolerance of Elephants	
Resident Characteristics (df=8)	F=4.26 p<0.01 N=150		F=5.06 p<0.01 N=150	
	Coefficient	***SE***	***Coefficient***	***SE***
Gender				
Female	-0.5	0.17	0.07	0.14
Male (reference)	--		--	--
Age				
18-40	0.68**	0.21	0.78**	0.18
41-60	0.33	0.22	0.33	0.19
61+ (reference)	--	--	--	--
Cattle Owned				
None	-0.08	0.19	-0.08	0.16
1-10	0.2	0.25	0.29	0.22
11+ (reference)	--	--	--	--
Relationship to Tourism Industry				
Currently Employed	1.22**	0.32	0.85**	0.27
Formerly Employed	0.29	0.25	0.27	0.21
Family Member(s) Employed	0.14	0.21	0.02	0.18
None of the Above (reference)	--	--	--	--

Table 5: The relationship between tolerance of lions/elephants, and resident characteristics, expressed as coefficients. * indicates p<0.05, ** indicates p<0.01

There was no difference detected between men and women for any of the four dependent variables (attitudes towards lions, attitudes towards elephants, tolerance of lions, tolerance of elephants). For all four of these dependent variables, residents in the youngest age group (18-40) were associated with significantly more positive scores than the other two age groups (41-60, 61+), which showed no significant difference between them.

Residents who owned no cattle reported significantly more positive attitude scores ($p<0.01$) for both lions and elephants compared to those who owned cattle, but there was no difference in tolerance (of either lions or elephants) for different cattle ownership groups. Residents who were currently employed by the tourism industry reported significantly more positive attitude and tolerance of lions and elephants compared to all other employment groups. There were no significant differences in the other groups, meaning those who had formerly held jobs and those whose family members currently held jobs did not show any difference than those who answered 'none of the above.'

Comparing Shorobe to Sankuyo

To examine if these independent variables are strongly associated with home village, Table 6 presents a comparison between Shorobe and Sankuyo residents in relation to those variables.

	Shorobe (n=90)	**Sankuyo (n=66)**	**Chi-Square**	**df**
Proportion of men	0.63	0.36	11.09*	1
Proportion with no cattle	0.32	0.85	42.52*	1
Proportion with 1-10 cows	0.22	0.07	6.07*	1
Proportion with 11+ cows	0.45	0.07	26.42*	1
Proportion currently employed in tourism	0.04	0.18	7.81*	1
Proportion formerly employed in tourism	0.16	0.28	3.21	1
Proportion with family employed	0.38	0.48	1.79	1

Table 6: Proportions of Shorobe residents and Sankuyo residents (* indicates p-value<0.05)

As expected, chi-square tests show a significant difference in many proportions between Shorobe and Sankuyo. Significantly fewer Sankuyo residents owned cattle than Shorobe residents, while Sankuyo had more residents currently employed in tourism. As home village has a strong association with costs and benefits associated with wildlife, I focused on a direct comparison of the two groups.

Residents were asked four yes or no questions pertaining to how lions and elephants affected their lives. In Shorobe, 98.4% answered yes to "would your life be better if there were no lions in this area?" By comparison, 50.9% answered yes in Sankuyo. Similarly, 95.2% of Shorobe residents and 48.3% of Sankuyo residents said yes to "would your lives be better if there were no elephants in this area?" When asked "Are lions good for [your village]," 3.0% said yes in Shorobe while 60.1% agreed in Sankuyo (with another 8.6% answering lions were both good and bad). Both groups were more positive in response to the question "Are lions good for Botswana?" In Shorobe, 68.9% said yes compared to 87.2% of residents in Sankuyo.

Attitudes reported towards both lions and elephants were significantly more negative for Shorobe residents than for Sankuyo residents. For lions, only 8.8% had positive attitudes (either positive or very positive) in Shorobe, while 40.9% were positive in Sankuyo (see Table 7 for full breakdown).

	Negative	Neutral	Positive
Shorobe	75.0%	16.2%	8.8%
Sankuyo	33.3%	25.8%	40.9%

Table 7: Attitudes towards lions (chi square = 31.2, df = 2, p-value<0.01)

The difference in attitudes towards elephants was also significant between Shorobe and Sankuyo, although the differences were smaller. Eleven percent of Shorobe residents responded positive or very positive, while 22.7% were positive in Sankuyo (Table 8).

	Negative	Neutral	Positive
Shorobe	76.6%	12.5%	11.0%
Sankuyo	45.4%	31.8%	22.7%

Table 8: Attitudes towards elephants (chi square = 16.2, df = 2, p-value <0.01)

When comparing tolerance of lions between villages, differences were not significant at the p=0.05 level. (Table 9). Examining individual columns in the table, there were differences in answers to the first two scenarios (“should all lions be killed?” and “if a lion is near a cattle post, should it be killed?”). But for the third and fourth scenarios, the difference in answers between the villages were minimal (“if a lion has killed one cow, should it be killed?”, “if a lion has killed ten cows, should it be killed?”).

	Should all lions be killed?	If a lion is near a cattle post, should it be killed?	If a lion has killed one cow, should it be killed?	If a lion has killed 10 cows, should it be killed
Shorobe	21.1% yes	74.4% yes	87.7% yes	94.4% yes
Sankuyo	12.1% yes	59.0% yes	86.3% yes	89.3% yes

Table 9: Tolerance of lions (chi square = 8.17, df = 4, p-value = 0.085)

Finally, the difference in tolerance of elephants between villages was also insignificant (Table 10). While 22.2% of Shorobe residents believed "all elephants should be killed," 16.7% of Sankuyo residents answered yes to this scenario. For the second scenario ("if an elephant is near a crop field, should it be killed"), 69.9% agreed in Shorobe while 59.1% agreed in Sankuyo. And for the final scenario, nearly identical proportions responded yes in Sankuyo and Shorobe (87.8% and 87.7%).

	Should all elephants be killed?	If an elephant is near a crop field, should it be killed?	If an elephant has raided crops, should it be killed?
Shorobe	22.2% yes	69.9% yes	87.7% yes
Sankuyo	16.7% yes	59.1% yes	87.8% yes

Table 10: Tolerance of elephants (chi square = 2.89, df = 3, p-value = 0.409)

Discussion/Conclusions

Differences in reported attitudes between the three species (lions, spotted hyena, and elephant) were small. For Shorobe farmers, average attitudes were slightly more negative for spotted hyenas and elephants (2.0 average for each) than for lions (2.2 average). Gusset et al. (2009) reported that spotted hyenas account for slightly more cattle losses than lions in the Shorobe area, a pattern that was corroborated by my fieldwork (Jacobsen, unpublished data). While this trend could account for the slightly more negative average attitude towards spotted hyenas, the majority of farmers felt negatively about both species. For Sankuyo residents, attitudes were less negative for all three species, and differences between the species were more pronounced (3.12 average for lions, 2.97 for spotted hyenas, and 2.61 for elephants). The more negative attitudes towards elephants are notable, although causal arguments are elusive here. Because Sankuyo residents are unable to keep cattle on their communal land, but continue to grow crops, elephants are a bigger problem and cause significantly higher and more regular financial losses than predators. At the same time, however, elephants have been the largest source of revenue and meat from Sankuyo's joint partnership with a safari hunting operator. Exactly how these costs and benefits combine with other factors to influence attitudes remains unclear.

Multiple regression analysis was performed across the joint Shorobe/Sankuyo sample in an attempt to separate the potential effects of costs and benefits derived from wildlife and people's attitudes and tolerance towards them. In separate regressions run for all four dependent variables (attitudes towards lions/elephants, tolerance of lions/elephants), two independent variables had the strongest effects on the model. The

first was age, and in particular, the youngest age group (18-40), which was a strong predictor for more positive reported attitudes and greater tolerance in all four cases. This is unsurprising, because age has been shown to be negatively correlated with positive attitudes towards wildlife in a number of studies (Naughton-Treves et al. 2003, Lindsey et al. 2005). This association is likely because age is highly correlated to education, as many residents over 40 received little to no formal education as children (Jacobsen personal obs.). Education has been highly correlated with attitudes and tolerance of wildlife in previous studies (Williams et al. 2002).

Residents currently employed by the tourism industry were also strongly associated with more positive attitudes and tolerance of both species, which is unsurprising. However, the lack of association for the other tourism groups perhaps was more surprising. Residents who had formerly been employed by the tourism industry, and those never employed but with close family members employed, did not report significantly different attitudes or tolerance than those who answered "none of the above." This suggests that positive attitudes and tolerance of potentially problematic wildlife species might be more related to direct and current benefits derived from those wildlife than from a more deeply rooted development of a conservation ethic or change in beliefs due to past experiences. This is discussed further when comparing attitudes and tolerance between Shorobe and Sankuyo below.

While the overall regression models contained significant predictors for all four dependent variables, the R-squared values were relatively modest (<0.22 for all) with high residual values in all cases. This suggests that while these costs and benefits and other

resident characteristics do correlate with attitudes and tolerance to some extent, there are also other factors that influence these reported feelings about wildlife not captured by the model. These could include deeply entrenched cultural factors, which have been highlighted in previous studies (Wilson 1997, Knight 2000), but speculating about these factors would be beyond the scope of this analysis.

When directly comparing data from Shorobe to Sankuyo, I reported a number of notable differences. Answers to the questions regarding benefits of lions and elephants differed drastically. When asked "Would your life be better if there were no lions in this area," 98.4% of Shorobe residents answered yes (compared to 50.9% in Sankuyo). Similarly, only 3.0% answered yes to "are lions good for Shorobe" (compared to 60.1% in Sankuyo). This suggests that even those Shorobe residents who reported neutral or positive attitudes and some tolerance of lions do not believe lions provide a net positive for Shorobe. This supports reported feelings of Shorobe residents that as a community, they have been excluded from access to tourism benefits (Jacobsen & Stronza in prep).

Unsurprisingly, there were significant differences in reported attitudes towards lions and elephants between Shorobe and Sankuyo. Shorobe farmers received few benefits from these wildlife species (current and former employment in tourism was very low), while costs incurred were high and widespread. As a result of these as well as other cultural factors, Shorobe respondents reported overwhelmingly negative attitudes towards both species. By comparison, Sankuyo residents reported more varied attitudes towards both species, which coincided with a more varied and differentiated distribution of costs and benefits. However, differences in reported tolerance of lions and elephants were not statistically significant at

the p=0.05 level. This means that for many residents, they reported positive attitudes, but still believed the species should be killed if found in a harmful situation. This suggests that the more positive attitudes reported in Sankuyo might have more to do with the immediate distribution of benefits and costs associated with these species, and less with something like a shift in mindset or conservation ethic that would ultimately change long-term behaviors. This has important implications for other studies that measure attitudes of local people towards wildlife or other environmental factors. A common assumption behind these studies is that people's attitudes towards wildlife will directly correlate with their behaviors, and that achieving increased attitudes can have lasting impacts on human-wildlife conflict and other positive conservation outcomes. While our data does not refute this assumption, it does suggest that there can be a more complicated relationship between attitudes, tolerance, and behaviors in conservation settings. This is supported by other studies as well (Liu et al. 2011, Dickman 2010).

Overall, I have used a comparative case study to highlight how costs and benefits associated with wildlife can combine with other factors to influence local people's attitudes towards and tolerance of sympatric wildlife species. I found that increasing benefits derived from wildlife, and decreasing costs should lead to an increase in attitudes towards them. However, this relationship was not straightforward, and these changing attitudes might sometimes fail to signify a long-term shift in conservation ethic or behavior.

CHAPTER IV

MISFIT NEIGHBORS: CONSEQUENCES OF LIONS AND LIVESTOCK SHARING A BOUNDARY IN BOTSWANA

Introduction

As we approached the site of the fatal attack, the farmer with us recounted what had happened three days earlier. We were walking through the bush about a kilometer off the road, near the village of Shorobe in northwestern Botswana, on the outskirts of the Okavango Delta. The farmer began the story by explaining that a group of four lions had been harassing and killing livestock near his cattle post for several days prior to the attack, killing at least four cows, three calves, and two donkeys. After finding the lions feeding on the final few carcasses, the farmers had had enough; a group of six farmers grabbed four rifles and set off to chase away or kill the lions. They followed the lions' tracks for several hours and more than eight kilometers, trying to keep a safe distance and only occasionally gaining sight of them. The group appeared to consist of two adult lionesses and two juveniles. The farmers took several shots at the lions from a distance as they followed, but never hit any, claiming the shots were intended to scare the lions away as much as to kill them.

As the farmer continued his story, we entered an area of semi-dense mopane scrub, where visibility was quite low. We were near the attack site now, the farmer informed us. After a few minutes, we pushed through the scrub into a small, open area, perhaps 50 meters across with a few smallish mopane trees scattered around it. This was where the

lion had attacked the farmers. Apparently, one of the adult females had finally turned back to confront them, perhaps in an effort to protect her offspring. Because of the low visibility, the farmers didn't see the lioness until she was almost on top of them, charging the group. The man recounting the story was able to get off one shot that hit the lioness in the torso, and the rest of the group scattered, two dropping guns as they tried to scramble up small trees. The lioness reached one of the farmers in the group before he could reach a tree. She broke his gun and mauled him. After a few moments, the animal retreated about 30 meters and simply lay down, seriously injured from the initial gun shot. The others rushed to the injured man who had severe wounds on his arms and torso. Three ran to get a car while the other two dragged the injured farmer for a kilometer to the road. They rushed him to the hospital, but tragically he did not survive.

Standing at the scene three days later, there were only minor signs of the attack. Human and lion tracks littered the clearing, a discarded shoe lost in the haste to climb a tree, and a few scattered bullet casings. Most jarringly, there was a drag-mark in the sand that ran off into the bush towards the road. We could not find the spot where the lioness had been killed, but the farmer assured us that the next morning, he had returned with several Department of Wildlife and National Parks (DWNP) officials who found the lioness nearby, apparently too injured to travel far. Because of the serious nature of the injury and the danger posed being so near the village, the wildlife officials had been forced to shoot and kill the lioness.

Thankfully, this story is relatively uncommon in Botswana. Human fatalities from lion attacks are rare; in the Shorobe area, this was the first such death in over twenty years. But

this attack does represent the most extreme manifestation of a persistent conflict between livestock management and wildlife management when these land use practices share a boundary. Such is the case in Shorobe, where their communal livestock land ends at the veterinary fence, separating it from a wildlife concession area. The concession is part of the Okavango Delta wildlife zone, which consists of the Moremi Game Reserve, Chobe National Park, and a number of surrounding wildlife concessions. While human fatalities are not common, the conflict more commonly manifests as lions killing the livestock of local farmers (most of whom are living at a subsistence level), and the less common retaliatory killing of those lions by farmers. To examine the conflict, I use a social-ecological approach, focusing on contrasting land uses and considering the areas on both sides of the wildlife/livestock boundary as part of a connected system. By considering the area as such, new insights about conflict emerge.

Farmer killed by lion

By Lesley Van Neel

A 40-year old man died of injuries on Monday afternoon after being attacked by a lion the previous day in the Shukumukwa area near Shorobe. The Regional Wildlife officer in Maun, Molothanyi Othomile has confirmed having received a report on the incident.

According to Othomile, a pride of lions had been terrorising the deceased's livestock and had already killed four of his cows.

He had apparently reported the matter to the Department of Wildlife and National Parks (DWNP), before he embarked on tracking down the lions.

It is reported that one of the lions, which had sustained a gunshot wound, attacked him, seriously injuring him.

He was taken to the Letsholathebe II Memorial Hospital where he died from his injuries.

Figure 3: Front page of Ngami Times, August 17 2012 (Neel 2012)

Figure 4: Photo from Ngami Times, August 17 2012 (Neel 2012)

Conservation as a Market: Producing Wildlife

At the root of many human-wildlife conflicts are deeper and persistent human-human conflicts (Peterson et al. 2010). This is particularly true for conflicts between humans and large predators. What manifests as predators killing livestock is frequently a symptom of broader social, economic, and political tensions relating to land management (Young et al. 2010). These tensions occur most obviously at the boundaries of conservation

territories and production landscapes. In Botswana, the contrast between conservation and production is particularly strong. Two of the country's most important industries are wildlife tourism, which occurs in conservation areas, and beef production, which is limited to agricultural lands (Hoon 2004). As the revenues from Botswana's diamond mining industry continue to decline, tourism and beef have emerged as priorities for a nation rich in land and wildlife, but relatively poor in industry alternatives (Darkoh & Mbaiwa 2002). Given these circumstances, tensions between land uses in Botswana are likely to intensify, along with human-predator conflicts.

Policies regarding land use in Botswana clearly designate communal, rural areas either for wildlife management or livestock (Tordoff 1988). Yet promoting both industries simultaneously has challenges. Requirements for each type of land use are different and even contradictory. Large predators are of particular significance, as they are amongst the highest tourism draws and, therefore, actively managed for in wildlife areas (Inskip & Zimmerman 2009). Yet predators can be a significant threat to ranchers and have been documented crossing fences to prey on livestock (Valiex et al. 2012). Also, a number of diseases can be transmitted from wildlife populations to livestock (Mbaiwa & Mbaiwa 2006). In response to these concerns, the Botswana government began erecting a series of veterinary cordon fences in the 1950s. The fences initially served to stop the spread of foot and mouth disease from wild buffalo populations (where the disease is endemic) to livestock (Scoones et al. 2008). More recently, however, the fences have become political boundaries that separate wildlife management zones from livestock zones, and serve as a semipermeable membrane that allows passage to certain species while inhibiting passage

to others. One such fence is located in Botswana's most well-known tourism attraction, the Okavango Delta. The villages of Shorobe and Sankuyo straddle this fence, about 45km apart on the southern edge of the Delta.

The Okavango Delta supports some of the highest densities and diversity of wildlife in Africa, including large populations of the complete guild of large African carnivores (lions, spotted hyenas, leopards, African wild dogs, and cheetahs) (Rich et al. 2016). The veterinary fence along the southern edge of the Delta was installed in 1982. This was followed shortly after by the adoption of the Community-Based Natural Resource Management (CBNRM) initiative, a series of policies and programs aimed at encouraging local people to conserve wildlife by giving them a direct stake in benefits derived from the wildlife tourism industry. CBNRM began with the Wildlife Conservation Policy of 1986 and gained momentum with other community-based conservation efforts through the 1990s (Mbaiwa 2004).

As one of the focal points for CBNRM, Sankuyo was given the communal rights to the concession area north of the fence that surrounded the village (NG34, an area of ~700 km^2). The CBNRM project was conceived as a joint venture between the community and a private hunting safari operator. The Sankuyo Tsharangano Management Trust (the STMT) has operated successfully from its inception in 1996, transitioning from hunting to a mixture of hunting and photographic safaris, and finally moving completely to photographic tourism after Botswana finalized a country-wide hunting ban in 2014. While the Trust has certainly faced periodic challenges, it has operated for nearly 20 years and is considered amongst Botswana's most successful and longest-running CBNRM projects (Jacobsen et al. in prep).

The granting of exclusive rights for NG34 to the village of Sankuyo had an important, if unintended consequence: the exclusion of the village of Shorobe. This combined with the new veterinary fence formalized the separation and contrast between wildlife and livestock management. For the purposes of this paper, I conceptualize the management of NG34 by Sankuyo (with the help of the government and NGOs) as *producing* wildlife in the same way Shorobe *produces* livestock; animals like elephants, buffalo, etc. are produced for consumption, either direct consumption as in the case of trophy hunting, or indirect as in the case of photographic tourism. Lions, while never part of the hunting quota, have always been considered amongst the most important species to produce in this context, as they are perhaps the biggest single draw for safari tourists (Okello et al. 2008). They are also amongst the biggest threats to Shorobe's livestock, especially its cattle (Gusset et al. 2009). As such, lions become an ideal prism through which to examine the conflict between livestock and wildlife management. When understood in this way, one can think of human-lion conflict as a symptom of the larger tension between two contrasting land uses.

Addressing the Problem

The goal of this paper is to investigate the following: 1) How does land use policy impact relationships between communities and their environment, and 2) how does that policy influence relationships between neighboring communities? More specifically, I consider how different land use designations inform how local people think about and behave towards lions. I use a social-ecological approach that takes into account the communal land of both Shorobe and Sankuyo as a single, connected unit with the

veterinary fence separating the livestock area from the wildlife area (Ostrom 2009). I investigate the following questions: A) How does the granting of rights to a community conservation project for one community, and the resulting exclusion of access to a neighboring community, contribute to the costs of and benefits from lions experienced by each? B) How does land use designation (determined at the regional level) shape local livelihoods and resulting uses of natural resources in neighboring communities? And C) How do costs and benefits from lions influence local peoples' tolerance and attitudes towards them?

The paper has three main parts. The first provides background for the analysis, including a review of the literatures on CBNRM and Human-Predator Conflict (HPC), and suggests how a synthesis of the two can help address management of boundary areas between wildlife and agriculture. I include a clarification of terms in the paper and history of the villages of Shorobe and Sankuyo. Secondly, I investigate the Shorobe/Sankuyo social-ecological system, focusing on interactions between ecological and social components and how outside stakeholders (government agencies, NGOs, private safari companies) affect local dynamics. Finally, I summarize implications of the case study for deepening understanding of community-based conservation, improving CBNRM practices, and reducing human-wildlife conflict, returning to the research questions posed above.

Methods

The core of the data used for this analysis comes from 12+ months of ethnographic research conducted in the villages of Shorobe and Sankuyo between 2011 and 2013. During

that time, I took part in regular participant observation of many aspects of life in each village, such as attending kgotla (community) meetings, working with farmers (in Shorobe) and spending time with escort guides and safari staff (in Sankuyo). During this time, I conducted 39 semi-structured interviews with key informants (17 from Shorobe, 15 from Sankuyo, and seven from outside stakeholders). Semi-structured interviews follow an interview guide that served as a roadmap for questions and topics, but allow the interview the freedom to explore topics as they arise (Bernard 2000). The interviews lasted between 45 and 120 minutes each. These interviews provided important background and contextual data, including the historical information reported in section 2.3. In addition, 156 personally-administered questionnaires (90 from Shorobe, 66 from Sankuyo) were conducted. The core data from the questionnaires, regarding the attitudes and tolerance of residents towards predators, is analyzed in depth in Jacobsen & Stronza (in prep), and cited in this paper. There were also several tangential questions from this questionnaire not reported in Jacobsen & Stronza (in prep) and included in this paper as primary data.

To complement the ethnographic data, I include published and unpublished data from two essential collaborators. The first is the Botswana Predator Conservation Trust (BPCT), an NGO that has been conducting research and administering conservation programs on the ground in the Shorobe and Sankuyo areas for over twenty years. The work of BPCT has included ecological research on predator behavior and conservation and a number of initiatives focused on social aspects of local conservation (see bpctrust.org from an overview of these projects; individual data will be cited as referred to in this paper). The second is the Okavango Research Institute (ORI), and specifically the work of Dr. Joseph

Mbaiwa, who has been conducting social science research in the region for 20 years. These secondary data provide much of the background information to the case study, and are cited specifically in that section.

Background

Bridging Community Based Natural Resource Management and Human-Predator Conflict Scholarship

During the 1970s and 1980s, traditional conservation policies and practices in southern Africa came under serious scrutiny. Critics argued that governments and wildlife managers relied on top-down management strategies that excluded local communities and failed to achieve sufficient conservation outcomes (Adams & McShane 1992). In response, the CBNRM Program emerged as a way to include local communities in the benefits and decision-making of wildlife conservation and tourism (Dressler et al. 2010). Following global trends towards Community-Based Conservation (CBC) and other "people-centered approaches," CBNRM gained support in Botswana in the early 1990s from both international conservation and development agencies as well as government policy-makers (Kgathi et al. 2004). The core principle of CBNRM is to devolve power from national government to local communities, which is designed to result in "real benefits for local resource users as well as secure rights to land and livelihood, and capacity building for management skills" (Mbaiwa et al. 2011). Crucially, CBNRM scholarship focuses on the benefits derived by wildlife, how those benefits are distributed, and whether they lead to

positive conservation outcomes. Evaluations of the success of CBNRM projects in southern Africa, mirroring a trend for wider CBC scholarship, have proven difficult and inconclusive (Hulme & Murphee 2001). The majority of such evaluative studies have been case studies, although, more rarely, systematic analyses have evaluated groups of projects to look for correlations between specific project traits and conservation success (for example see Salafsky et al. 2001). In most studies, however, evaluations of CBNRM projects have analyzed the project or projects in question as contained systems, without considering communities outside the project area(s) (Adams et al. 2004). Because granting certain communities rights to a natural resource for a CBNRM project almost by definition excludes other, nearby communities, it is essential to understand the repercussions for those excluded communities. Members of excluded communities are also interacting with the wildlife populations that are providing benefits, and their behaviors and attitudes towards wildlife have implications for conservation.

While CBNRM scholars focus primarily on *benefits* for communities who have access to designated natural resource areas, the human-predator conflict (HPC) literature mostly studies *costs* of wildlife on agricultural production (and vice versa) that take place in agricultural zones. These costs come in the form of livestock depredation caused by predators and paid by agricultural producers, as well as the retaliatory killings of predators by farmers (Treves & Karanth 2003). Conservation initiatives often focus on *minimizing* or *mitigating* these costs in order to improve attitudes and behaviors towards the predators in question (Inskip & Zimmerman 2009). To help minimize conflict, some HPC papers analyze the ecological aspects of livestock depredation or crop raiding, in order to predict the

situations where attacks are most likely to occur (Treves et al. 2004, Marker et al. 2003). Others use social science techniques to measure attitudes and behaviors of local people towards wildlife in order to correlate key variables such costs and benefits from predators, income, and education with attitudes and behaviors towards those predators (Lindsey et al. 2005, Rodriguez 2008). When trying to mitigate costs, compensation schemes have become a popular strategy to redistribute costs of predators from locals to the wider global conservation community who place greater value in them. Typically, a compensation scheme will make a direct payment to local farmers in the event that their livestock is killed by predators (Dickman et al. 2011). These payments are designed to offset the costs of predators, thereby decreasing negative attitudes and behaviors towards predators that result from the depredation events.

While considered in tandem, it becomes clear that the *benefits* studied by CBNRM and the *costs* focused on by HPC are often two sides of the same coin. In main cases, the very predator populations generating benefits through tourism are simultaneously creating costs paid by neighboring farmers. For both CBNRM and HPC scholarship, a significant percentage of papers focus on case studies, especially amongst those studies focused on the local level (Graham et al. 2005, Williams et al. 2002). And these case studies tend to focus on areas or projects that occur within a single land use (i.e., wildlife areas for CBNRM projects, agricultural areas for HWC studies). In this study, I consider the communal lands of Shorobe (designated for agriculture) and Sankuyo (NG34, designated for wildlife) as one connected social-ecological system, a system that is shaped by the boundary running through its center. The veterinary fence serves as a physical as well as a political boundary. I

focus specifically on lions, which serve as a lens for viewing and understanding the system as a whole. Lions are emblematic of the system because they create significant benefits for the wildlife zone while simultaneously inflicting large costs in the agricultural zone.

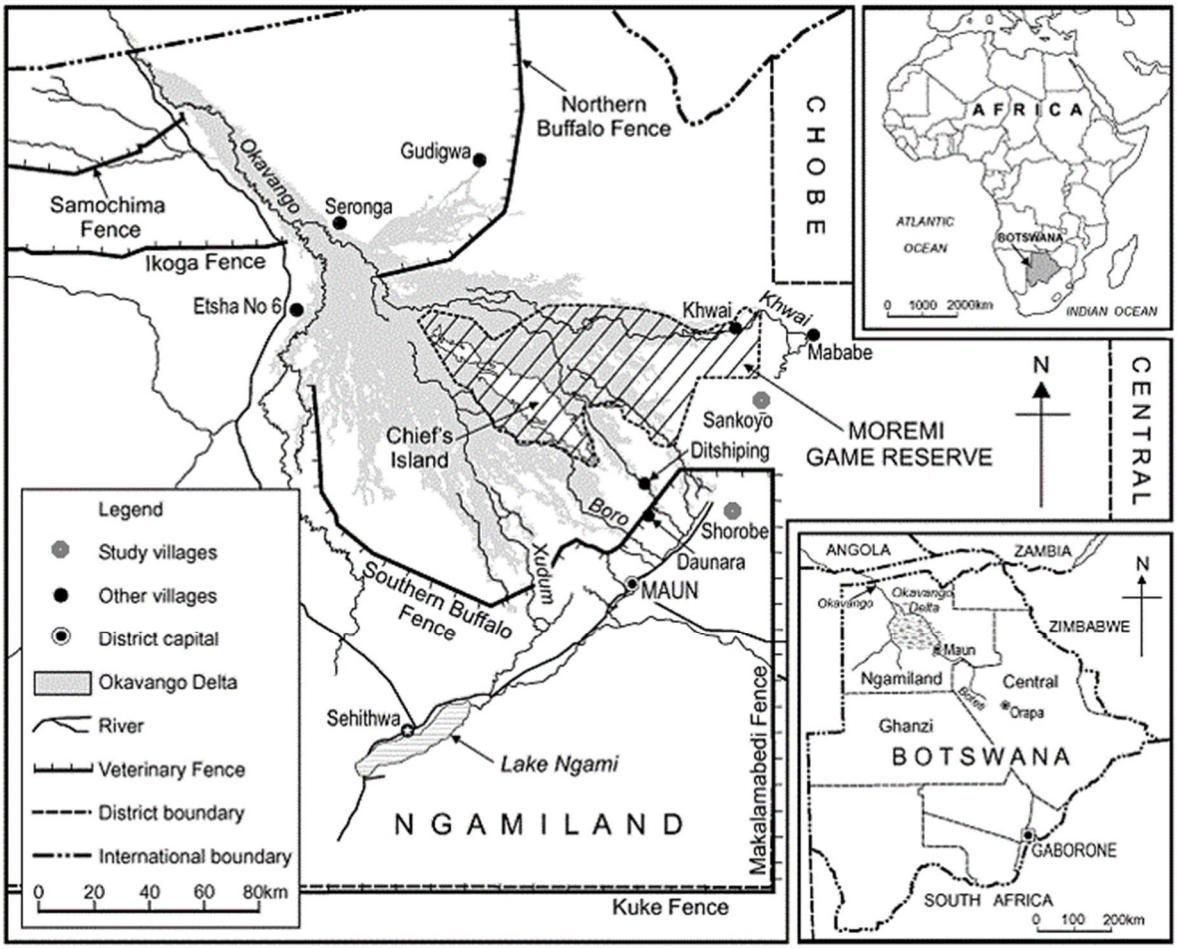

Figure 5: Map of study area (altered from Mbaiwa et al. 2008)

Our designation of the social-ecological system of Shorobe/Sankuyo, and our choice in using lions as the lens for analysis, are heuristics meant to help generate novel

conclusions and avenues for discussion, rather than a claim of truth or validity. The combined Shorobe/Sankuyo area is not a "true" system that is more correct to analyze than considering Sankuyo's area on its own, or considering Sankuyo and the other wildlife concessions that border it to the north as one system. Similarly, lions aren't "correct" to use, in place of another species or a different unit of analysis. In both cases, however, I hope they will help to add context and ideas to the fields of CBNRM and HPC.

Clarification of Terms

To avoid confusion, I provide definitions of relevant terms. From Carney (1998), "livelihood" is defined as comprising: 'the capabilities, assets (including both material and social resources) and activities required as a means of living.' Livelihood is seen as a 'highly complex, all-encompassing concept, which is not restricted to [either] the ecological or to the economic or productive aspects of life' (De Haan & Zoomers 2003). Livelihoods are chosen and practiced by individuals or households, and chosen within the wider constraints of the system in which those individuals reside. One of the most important of these constraints is the land use designated where those individuals live. I define "land use" as the designated possible livelihood options available to individuals living in an area. This is determined by a government agency or legislation. The options could be varied (for example in an urban area without strict zoning designations) or extremely narrow (for example in a national park where residence and use are strictly controlled). In Botswana, the Tribal Lands Act gives land use designation power to the local land board (Kabamalu

2006). I will discuss the differences in land use designations from our case study in the following sections.

Neighboring Land Uses, Divergent Livelihoods

> In the old days, I would say it was the idea of 'manda.' Manda is a Seyei word, it is a bit hard to translate, but it means something like mobile, resourceful. We were Bayei people, and we were always traveling to different areas and using different resources. If we had trouble with our crops, we could go and fish or hunt. If the fishing wasn't good, we had cattle. We were cooperating with other communities. Of course, cattle was very important to us, but perhaps not as much as to others, because we were skilled in many areas. But these days, we aren't moving around like that anymore.
>
> -Sankuyo woman, on "what distinguishes the culture of Sankuyo?"

The villages of Shorobe and Sankuyo were both originally settled in the 19th century as part of a migration of a Bayei tribe traveling south from the Caprivi Strip. When they reached the Sankuyo area, a group settled there and began farming, while others continued south and settled in Shorobe or surrounding areas. A few families kept cattle in Sankuyo, but at that time the Sankuyo area was located at the edge of tsetse fly habitat, which causes trypanosomiasis in cattle, making serious livestock production unviable. For that reason,

most cattle were kept in the Shorobe area. However, during this pre-colonial period, movement of people and resources was much more fluid between the two villages. Sankuyo residents kept cattle in the Shorobe area with family members, and Shorobe residents crossed into present day NG34 for hunting, fishing, and gathering expeditions. The tsetse fly threat also waxed and waned in the Sankuyo area, so some cattle were brought further north in good years.

Following independence in 1966, the Botswana government began the task of transitioning towards a modern economy from what had been an entirely a traditional, pre-monetary system (Dressler et al. 2010). The country's rich diamond reserves provided a crucial backbone for the new economy, but in an effort to diversify capital creation and foreign exchange, the government tapped into the dominant force of the pre-independence political economy: cattle (Hoon 2004). Beef production and export quickly became the country's second largest industry. However, the industry faced a problem in the form of foot-and-mouth disease, which was endemic in wild buffalo populations and would periodically break out in domestic cattle herds. European markets, Botswana's most important export destination, had strict rules against importing any beef from areas with foot-and-mouth (Scoones et al. 2008). To combat this problem, Botswana began to install a series of veterinary cordon fences. These fences were designed to separate livestock areas from wildlife zones in order to reduce transmission of foot-and-mouth from buffalo to cattle. Today, these fences run for hundreds of kilometers and span all parts of the country.

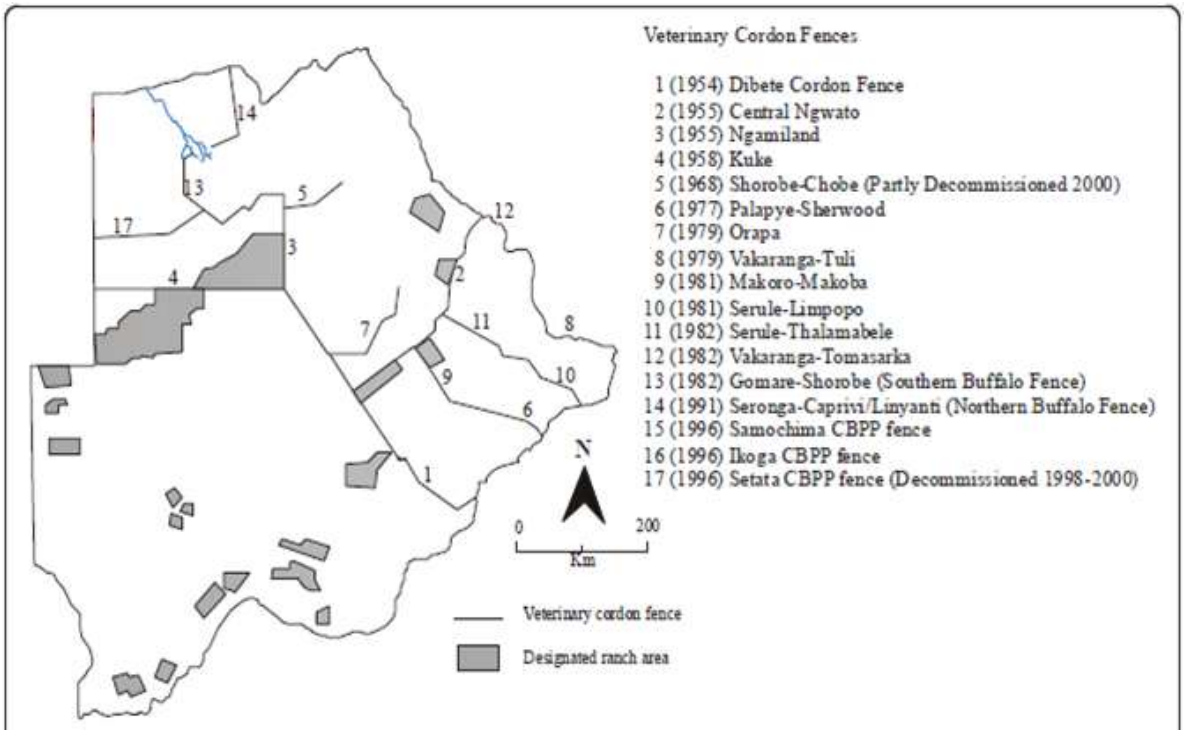

Figure 6: Botswana's veterinary cordon fences installed from 1954 to 1996 (altered from McGahey 2011)

When determining where to locate the Ngamiland veterinary fence in 1982, the area between Sankuyo and Shorobe stood out as a natural choice. Northeast and northwest of Sankuyo, Chobe National Park and Moremi Game Reserve had been established shortly before independence, and a number of hunting concessions had already been designated and leased for areas surrounding the parks, creating a large wildlife management zone. And from an outsider's perspective, it appeared that Sankuyo and Shorobe residents had already created a de-facto boundary for cattle production at the Sankuyo-Shorobe border. The fence was erected in 1982, running east to west, separating Sankuyo's NG34 from Shorobe's tribal area. This distinction was reinforced in 1995, when Sankuyo was selected by

government and consulting NGOs to become one of the flagships of the CBNRM Program in Botswana with the establishment of the Sankuyo Tshwarangano Management Trust (the STMT). This Trust was and continues to be owned and operated by the community, and has limited decision-making authority over management of NG34 (limited by the land use designation as a wildlife concession by the land board). Since its inception, the Trust has participated in a series of joint venture projects with private trophy hunting and photographic safari operators. Meanwhile, Shorobe lacked any realistic access to tourism revenue, while also being cut off from those traditional hunting and fishing areas that were located within the NG34 boundary. Instead, government promoted the production of cattle, with Shorobe gaining access to the infrastructure for selling beef to international markets (Tordoff 1988). Therefore, the formation of the veterinary fence and subsequent political boundary served to separate and formalize the land use designations for both villages. Each village gained access to important new international markets, but simultaneously saw a constriction of available livelihood options (especially Shorobe). The concept of 'manda' lost relevance for both villages.

Two Villages Connected: Analysis of a Local System

Vet Fence as Semipermeable Barrier: Analysis of the Shorobe/Sankuyo System

In biology, a semipermeable barrier (such as a cell membrane) is a boundary that allows certain compounds to pass through while excluding passage to others. Certain small compounds can pass straight through the membrane by simple diffusion, while other

compounds pass through only selectively via mechanisms like active transport. Many large particles are unable to pass through at all, and there are also agents like viruses that can force their way through the membrane and disrupt the system.

The semipermeable cell membrane is an apt metaphor for considering the veterinary fence and accompanying political boundary that separates NG34 from Shorobe's land, and serves as a useful starting point for considering the Shorobe/Sankuyo social-ecological system. Many components of this system can pass through the boundary as if it weren't even there, such as birds, rodents, and plant species that pollinate via wind. For other species, passage is possible but selective; lions and other large predators have been documented crossing the fence through holes dug underneath it. People can also pass through selectively, either by following political rules and going through the official gate, or by breaking the rules and climbing over a more remote section of the fence. Conversely, neither cattle nor buffalo can pass through the boundary at all, at least not when the fence is functioning properly. Finally, and at the risk of overextending the metaphor, elephants could be considered like a metaphorical virus in this context; they can force their way through the fence, leaving behind a hole through which cattle, buffalo, or other previously restricted species can pass.

These characteristics of the livestock/wildlife boundary shape many important interactions that take place within the Shorobe/Sankuyo system. Therefore, the metaphor is useful as I move into analysis of relevant ecological and social components of the system.

Study Site Ecological Features

The Shorobe/Sankuyo area is located on the southeastern edge of the Okavango Delta, which is a permanent inland delta located in northwestern Botswana. The area is situated in a semi-desert ecosystem, dominated by the flood cycle of the delta that creates seasonal wetlands on the western side of the study area (McNutt 1996). Because these floods, which peak in June, occur out of phase with the rainy season (November through March), there is a consistent source of fresh water (Cozzi et al. 2013). As a result, most ungulate species, and the predator species dependent on them for food, are relatively sedentary (Bartlam-Brooks et al. 2011). In NG34, a full complement of wildlife species is present in healthy numbers, including 11 ungulate species and the full guild of African large carnivores (lion *Panthera leo*, spotted hyena *Crocuta crocuta*, leopard *Panthera pardus*, African wild dog *Lycaon pictus*, and cheetah *Acinonyx jubatus*) (Stein et al. 2015). The Botswana Predator Conservation Trust (BPCT) has been conducting long-term research on these carnivore species in NG34 for more than 20 years, resulting in extensive data regarding carnivore ecology, behavior, and conservation in the area (for example Abrahms et al. 2016, Wilson et al. 2013, Webster et al. 2010; see bcptrust.org for full publication list). In contrast, on Shorobe's land, wild ungulate species are occasionally observed, but their presence is rare (Cozzi et al. 2013, Jacobsen pers. obs.). Ecologically speaking, habitats of Sankuyo and Shorobe's lands are similar, and if there were no human inhabitants in the area, wildlife densities and distributions would be expected to be comparable between the two (J.W. McNutt, pers. comm.).

Ecology of Lions and Cattle, and Interactions Across the Boundary

Lions are social and territorial animals. In the Okavango Delta, lions live in prides of between 3-15 individuals, and occupy large home ranges that overlap with neighboring prides (BPCT unpublished data). The average home range size in NG34 is 200km^2, with a total of seven prides and a population size of 107. Because multiple females can breed at the same time, prides are capable of producing large numbers of cubs in good years (up to 13 have been documented). The average reproduction rate for this population is 1.64 per adult female, with 75% of cubs surviving to twelve months of age. When the NG34 concession is considered as managed to produce lions and other wildlife, one can see that it yields a steady flow of dispersing individuals, some percentage of which will inevitably cross the fence into Shorobe's land. In a study of GPS-collared lions from prides in NG34, Cozzi et al. (2013) found these lions to have a low cross-rate (7.2%) when individuals approached the fence. This rate was significantly lower than those of spotted hyenas and African wild dog, suggesting the fence may be less permeable for lions than for these smaller-bodied species. Additionally, there has been no evidence to date of a pride establishing a permanent home range on Shorobe's land. From this data alone, one might conclude lions do not pose a serious threat for livestock in Shorobe.

However, this contrasts with data collected while conducting ethnographic research with Shorobe farmers. In nine field months spent in Shorobe between 2011 and 2013, lions accounted for over 35% of reported negative predator interactions, which included direct sightings of predators, tracks and signs of predators, and direct predation events; spotted hyenas accounted for over 40%. The data were not systematically collected, but while the

ratios should not be considered precise, a significant presence of lions in Shorobe is undeniable. The majority of this fieldwork took place in the dryer winter months, when presence of lions might be higher than during the wet season. When combined with well documented, regular losses of livestock due to lions in Shorobe (Gusset et al. 2009, Jacobsen pers. obs.), it appears lions are either crossing the fence and then returning to NG34, or dispersing and spending time in Shorobe before continuing in search of more suitable territory. Regardless of the specific behavior of the lions, the livestock of Shorobe residents is under regular threat from lion predation.

Shorobe farmers keep cattle, as well as smaller numbers of sheep, goats and donkeys, at 67 cattle posts. Each cattle post houses between 10-800 cows (most have between 30 and 200), with between one and six owners sharing a cattle post. Typically, these animals are kept in kraals, or traditional corrals, overnight and allowed to roam and forage during the day. They are occasionally accompanied by herders or dogs while they graze, but more commonly they are unaccompanied, and trained to return each evening to receive drinking water from the cattle post's borehole, or well. If the herd fails to return by a certain time, herders will do their best to find them and bring them back to the kraal. However, it is not uncommon for part or all of the herd to spend some nights in the bush, where they are more vulnerable to predation from lions and spotted hyenas (Gusset et al. 2009, L. Rich unpublished data). It has been reported in numerous studies throughout Africa that improving livestock husbandry practices could lead to decreased predation (Inskip & Zimmerman 2009, Gusset et al. 2009). This is true in Shorobe; predations could be reduced if kraals were better built and maintained, and if herders ensured livestock spent every

night in these kraals. But the construction and maintenance of effective kraals can be expensive and labor-intensive. And as it becomes less acceptable to use boys as herders who spend their days following livestock and not attending school, adult herders are often unable or unwilling to spend all day in the bush following their cattle.

Even if one imagines an ideal scenario, where predator populations are closely monitored, the veterinary fence is actively maintained, and animal husbandry practices are improved, a certain amount of livestock predation should be seen as an inevitable consequence of the proximity of these two contrasting land use strategies. Put another way, some livestock predation can be considered an unavoidable cost that accompanies the benefits associated with wildlife tourism. So how are these costs and benefits distributed amongst local people? And how does the designated land use impact the access to resources and viability of livelihood choices for Shorobe and Sankuyo residents?

Social Factors in the Shorobe/Sankuyo System

With the installation of the fence in 1982 and the granting of control of NG34 to the STMT in 1995, the separation of wildlife management in Sankuyo and livestock management in Shorobe was formalized. But this separation was not complete, and access to alternative livelihood options were not equal across or within the two communities. While it became illegal for Sankuyo residents to keep cattle in NG34, they were allowed to continue growing subsistence crops (mostly maize), and informally were allowed keep a small number of sheep and goats. While many families have stopped keeping these small stocks because of the high predation rate and availability of alternative income options

from wildlife tourism, it remains an option. In addition, Sankuyo residents have the option of owning cattle that are kept by family members or friends in Shorobe or elsewhere. In our questionnaire, nine of 61 Sankuyo residents reported owning cattle that was kept outside their concession. But when asked "if you wished to own cattle, could you," all but six people (90%) answered yes. So, while not all Sankuyo members take full advantage of access to agricultural choices, most feel they have the option to do so. One male Sankuyo resident, recently out of school and looking for a job, explained that "I don't have any cattle now because I don't have a job. But once I start working, I can buy a few cows and keep them at my uncle's cattle post [south of the fence]." In contrast, a majority of Shorobe residents felt disenfranchised when it comes to access to wildlife tourism benefits. Unsurprisingly, of those surveyed, only one of the 65 people living and working at cattle posts had jobs in tourism (a woman who had an agreement to make traditional baskets for a souvenir shop). Of the 25 surveyed Shorobe residents living in the village proper, only three had jobs in tourism, and two others had previously held such jobs. Fifteen of these 25 village residents (60%) did have one or more family member working in tourism, as compared to 46% of cattle post residents. In Sankuyo, 100% of the surveyed residents answered yes to this question. When asked "if you wanted to work in the tourism industry, could you," 34 of 90 people (38%) answered yes. One Shorobe farmer around 40 years old who kept cattle and grew crops answered "there are no jobs available for Shorobe," and this sentiment was echoed by the majority of Shorobe residents. While Shorobe residents were not completely shut out from tourism benefits, those benefits remain limited and unevenly distributed.

There is also an important distinction in how these two communities are integrated into the larger Botswana economy. From its inception in 1996, the STMT has been managed as a communal project that operates in a nebulous space between social welfare and market capitalism. Although the STMT receives oversight and assistance from the government and various conservation NGOs, the Sankuyo community is ultimately responsible for management and decision making. The community as a whole appoints a board, which is a rotating group of community members. This board makes most individual management decisions, such as hiring of personnel and day-to-day budget allocation. Big decisions, such as approval of a general management plan or signing a contract with an outside partner for the tourism joint-venture, are brought to kgotla meetings for a vote by the full community membership. When asked about the purpose of the Trust, 14 of 15 Sankuyo residents responded that community development and/or poverty alleviation was the primary purpose, rather than profit generation. Furthermore, I asked people about conflicts between community members regarding the Trust, and the most common answer involved unequal distribution of jobs, benefits, and decision-making power between different Sankuyo families. One older Sankuyo woman, who had never worked directly for the STMT, answered that "there used to be jealousy because some families had jobs with the Trust and others didn't. But now, most families feel the jobs are given fairly." So while benefits were not distributed evenly between Sankuyo residents, it is clear that fair distribution has been a management priority for the Trust, perhaps at the expense of profit maximization.

Without such a mechanism and lacking formal access to a wildlife tourism area, Shorobe residents must look for employment opportunities with private tourism companies on a case-by-case basis. Like other rural areas in the Ngamiland district, Shorobe is part of a transitioning economy that relies on a mixture of subsistence and market livelihood options. Residents compete with others in the region for a small number of salaried jobs, 40% of which are from the tourism industry, and those unable to secure a job must either rely on subsistence agriculture or move to an urban area in search of employment (Hoon 2004). The situation is marked by uneven distribution of benefits amongst Shorobe residents, with relatively few individuals and families receiving the majority of benefits. Meanwhile, costs are distributed more widely across members of the village in the form of livestock depredation. This all contributes to a feeling in Shorobe that the community as a whole does not benefit from wildlife or from lions in particular. In response to the question "are lions good for [your village]," only 8% (seven of 90) said yes, as compared to 67% (40 of 61) in Sankuyo.

While the designation of NG34 for wildlife management has created certain advantages for Sankuyo, it has also been responsible for constraining development. The Botswana government refuses to pave the final section of road that would connect Sankuyo to Maun, the district capital and only important urban center in the region. The road is paved from Maun until Shorobe, but despite calls from Sankuyo residents, there are no plans to extend, because leaving the road unpaved is perceived as better for wildlife populations and for tourism. In addition, the Botswana government is unlikely to upgrade village amenities, such as the school or clinic, because they do not want to encourage

increasing the population residing within the wildlife zone. While these constraints are significant, overall I have documented that Shorobe residents face a disproportional amount of costs associated with local lions, while Sankuyo residents have access to more lucrative and more evenly distributed benefits. So how do these ecological and social components influence how locals think about and behave towards lions?

Local Residents' Attitudes towards and Tolerance of Lions

I measured the attitudes towards lions of both Shorobe farmers and Sankuyo residents in order to compare between the villages. To measure attitudes, I used a Likert-like scale, giving five possible responses to the question "How do you feel about lions?" The choices were 1) very negative 2) negative 3) neutral 4) positive and 5) very positive. For a full description of methods and analysis, see Jacobsen & Stronza (in prep).

	Very Negative	Negative	Neutral	Positive	Very Positive
Shorobe	27.7%	46.2%	16.9%	9.2%	0%
Sankuyo	16.7%	21.7.%	25%	25%	16.7%

Table 11: Shorobe vs Sankuyo attitudes towards lions (Jacobsen & Stronza, in prep)

Unsurprisingly, attitudes towards lions were largely negative for Shorobe farmers. Seventy-four percent of respondents reported negative or very negative, while only 9%

were positive (and 0% very positive) (Table 11). Comparatively, feelings were more mixed in Sankuyo, where 33% were negative or very negative, with 42% reporting feeling positive or very positive. These data suggest the perceived costs and benefits derived from lions combine with culture, age, education, and other factors to influence attitudes towards them (Jacobsen & Stronza in prep). If judging from attitudes alone, it would appear the STMT and resulting distribution of benefits and costs have caused Sankuyo residents to have a more positive outlook towards lions than Shorobe farmers have. When HPC scholars measure attitudes towards predators, positive attitudes are often considered a sign of an increase in conservation ethic that will lead to better conservation outcomes (Kotchen & Reiling 2000). But when investigated, several studies have found a lack of such association, so such a pattern should not be assumed (Liu et al. 2011).

In addition to attitudes, I also asked questions designed to measure the tolerance of lions. As a proxy for tolerance, I used four hypothetical scenarios and asked if a lion should be killed in each. The four questions were 1) Should all lions be killed? 2) If a lion is near a cattle post, should it be killed? 3) If a lion has killed one cow, should it be killed? and 4) If a lion has killed 10 cows, should it be killed? Results are shown in Table 2 below.

	Should all lions be killed?	If a lion is near a cattle post?	If a lion has killed 1 cow?	If a lion has killed 10 cows?	No to all
Shorobe	20.6% yes	71.2% yes	87.3% yes	92.1% yes	7.9%
Sankuyo	8.5% yes	59.3% yes	84.8% yes	88.2% yes	11.8%

Table 12: Shorobe vs Sankuyo Tolerance of Lions (Jacobsen & Stronza, in prep)

Comparing tolerance of lions complicates the comparison of Shorobe and Sankuyo residents (Table 12). For the first and second scenarios, there are differences between the two groups. When asked if all lions should be killed, 21% of Shorobe residents said yes, compared to 9% in Sankuyo. For the second question (If a lion is near a cattle post, should it be killed?) there is a similar 12% difference, with 71% yes from Shorobe and 59% from Sankuyo. While there is a difference here, it is notable that almost 60% of Sankuyo residents did believe a lion should be killed in this scenario. For the final two questions (If a lion kills 1/10 cow(s), should it be killed?), the difference nearly disappears. Overall, differences are much larger between Shorobe and Sankuyo residents when measuring attitudes than when measuring tolerance.

When considering these attitude and tolerance data in the context of the wider social-ecological system described in this paper, it suggests that attitudes and possible behaviors towards predators could have more to do with the current distribution of costs and benefits, and less to do with a larger change in conservation ethic. It suggests that for many Sankuyo residents, positive attitudes come from the removal of costs associated with livestock predation and the perception of direct benefits from wildlife tourism. If true, then it could be expected that these attitudes could be quite malleable; if circumstances were to change, attitudes could be expected to change with them.

Discussion

Out findings suggest several lessons for CBNRM and HPC scholarship, as well as implications for management of conservation and development programs located near a

boundary between wildlife and agricultural land use. The first lessons emerge from the framing of the study; the granting of rights and exclusive access of natural resources to certain communities often necessarily *excludes* other communities and stakeholders. When measuring the effects of CBNRM or similar projects, researchers should acknowledge and account for this where possible. Secondly, while efforts to reduce conflict and promote coexistence between predators and local people are useful and important, HPC scholars and conservation managers should also acknowledge that some baseline level of conflict might sometimes be unavoidable. I demonstrated that the lion population found on the wildlife side of the boundary was producing a steady stream of dispersing individuals, while the cattle produced on the livestock side would likely remain vulnerable to predation even if husbandry practices were improved. While many conservation biologists might be ready to concede some acceptable baseline conflict in the form of lions killing livestock, I imagine they would be much less willing to agree that some small rate of retaliatory killings might also be unavoidable.

The study also has implications for the compensation schemes that have become a popular mitigation strategy in HPC. As a conservation strategy, evidence for conservation schemes producing positive conservation outcomes has been inconclusive and unconvincing (Dickman et al. 2011). While some compensation schemes have shown positive conservation outcomes (Mishra et al. 2003), many have shown no measureable effect (Naughton-Treves et al. 2003, Miquelle et al. 2005, Montag 2003), while results from some projects have even suggested a negative conservation impact (Bulte & Rondeau 2005). I suggest, however, that when considering the distributions of costs and benefits of

predators, that compensation schemes could be justified on social justice grounds as well as conservation grounds. If individuals or communities are excluded from benefits from predators while simultaneously subjected to significant costs, it could be argued that compensation is justified regardless of whether these payments result in increased conservation outcomes.

For this case study, local people's attitudes towards lions were correlated to how the costs and benefits of those lions were distributed. This distribution, in turn, was tied closely to the land use designated by the government, which determined the access to wildlife tourism and conservation programs. But while attitudes were tied closely to land use, tolerance was found to have a much weaker influence. This suggests that the differences in reported attitudes could be due largely to the current distribution of costs and benefits rather than a shift in underlying conservation priorities. If this is true, then changing these distributions of costs and benefits could be expected to have an impact on attitudes of local people towards predators. While these associations won't follow the same pattern in every case, I contend that to understand human-predator conflict, addressing how costs and benefits are shaped by land policy is crucial.

There are some important limitations and additional questions that emerge from this analysis. By focusing on land use, I have identified a relationship between the cost/benefit distribution and attitudes towards wildlife, but are not able to parse the relative contributions of the costs relative to benefits. Costs and benefits are more than a simple economic calculation, but are impacted by social and cultural factors as well. For example, cattle serve more than an economic and livelihood function for Batswana citizens;

it is an integral part of their culture. Owning cattle serves as a signifier of social status, and gifting cattle for weddings and funerals has important cultural significance beyond its economic value (Hoon 2004). Therefore, it is possible that even if Shorobe residents are able to generate benefits that are economically equal or greater than the costs associated with livestock losses, this will not lead to equally positive attitudes or behaviors. Further investigation of how these costs and benefits interact with each other to impact attitudes would be useful. Another fruitful avenue for further study would be to determine how attitudes and tolerance correlate to behaviors towards lions. Measuring behaviors towards predators can be difficult, especially when the persecution of predators is illegal. For this reason, measuring attitudes is much more common; attitudes towards predators are known to affect people's behaviors towards them (Kotchen & Reiling 2000). However, other studies have shown that peoples' behaviors are also strongly shaped by other factors, such as level of exposure to those predators, or religious or cultural traditions (Liu et al. 2011). While our measure of tolerance was designed to address some of these issues, further investigations in how negative behaviors towards lions correlate with attitudes, tolerance, and other factors is crucial to fully understand the conservation implications for lions in the region.

Conclusion

Almost a year after the fatal lion attack, we sat with several Shorobe farmers, eating fresh watermelon at a cattle post located less than two kilometers from where the attack had taken place. After several weeks of increased lion and hyena activity in the area, the

farmers had spent the morning repairing the cattle post fences. When conversation turned to the attack, I asked if it had changed how they feel about lions. One farmer, a former DWNP wildlife ranger who had recently retired to take care of his family's cattle, explained:

> That was a sad incident, but you can't live in fear when you are in the bush every day. The real problem is for our cattle, and that hasn't changed [since the attack]. A week ago, I had to chase a lion away from our krall in the middle of the night…Cattle is all I have left, now that I don't have a salary. It's the same for these guys. So that is what we worry about.

This was a common sentiment among Shorobe farmers. Understanding these conflicts --whether the rare occurrence of a lion attacking a human, or the more frequent depredation of cattle or retaliatory killings of lions by farmers -- as symptoms of larger conflicts between neighboring land uses, should be a necessary prerequisite for anyone looking to better understand human predator conflict or to achieve better conservation outcomes at the boundaries of wildlife and agriculture.

CHAPTER V

CONCLUSIONS

Since each individual chapter includes a formal conclusion, the dissertation concludes here with a summary of the overall themes and lessons from the research. This study used an ethnographic and social-ecological approach to study relationships between local people and wildlife in villages on either side of the wildlife-agriculture boundary in the Okavango Delta region of Botswana. Sankuyo and Shorobe, the two villages focused on, are similar in size and cultural characteristics. They were even more similar before the erection of the veterinary cordon fence in 1982, and the subsequent formalization of the land use boundary between them. This designation separated the area north of the fence (where Sankuyo is located) as a wildlife management zone, and the land south of the fence (where Shorobe is located) as an agricultural zone. This formalization of the boundary continued in 1996, when Sankuyo and NG34 (the wildlife concession within which the village of Sankuyo was located) were chosen as one of the initial locations for Botswana's new Community Based Natural Resource Management (CBNRM) initiative. Part of the wider community-based conservation movement, CBNRM was designed to empower local communities by giving them a direct stake in benefits derived from local wildlife. Sankuyo was given official tenure over the NG34 wildlife concession, and allowed to choose joint-venture partners to conduct hunting and photographic safaris in their area.

The CBNRM program was established with the ambitious duel goals of achieving meaningful wildlife conservation outcomes while simultaneously allowing local

communities greater authority to manage and benefit from the natural resources within their tribal lands (Mbaiwa et al. 2011). Understanding what impacts the CBNRM program have had on regional wildlife populations is difficult. While each individual project occurs within a small area (which includes the participating village and its surrounding concession), most wildlife populations roam over much larger areas, and the health and abundance of these populations can be impacted by many different factors across various scales. Even measuring changes in these populations can be difficult, and linking any changes to specific management practices is even more so. While such an assessment is not the purpose of this dissertation, I do hope that examining changes in local attitudes of Sankuyo residents regarding their CBNRM project, as well as comparing attitudes and tolerance towards wildlife between residents of Sankuyo and Shorobe, can improve our understanding of how the CBNRM initiative and land use policy has impacted these communities as well as the local wildlife that share their territory.

The primary tool in studying relationships between people and wildlife for this study was the measuring of reported attitudes and tolerance of lions *Panthera leo* and elephants *Loxodonta africana.* Unfortunately I do not have access to comparable data of attitudes from before the establishment of CBNRM or before installation of the veterinary fence. However, chapter two does analyze a dataset that provides insight into how Sankuyo resident attitudes have changed about their CBNRM program, and about how they view benefits associated with wildlife. In 2013, I interviewed fifteen people in Sankuyo, asking those individuals the same questions they had been in asked in 1997, a year after the establishment of the Sankuyo Tsharangano Management Trust (STMT). The interviews

focused on participants' knowledge of and attitudes towards the STMT. By re-interviewing the same individuals after sixteen years of operation, I was able to measure how these responses changed over time. These data revealed several trends useful in understanding how CBNRM and living in a wildlife management zone has influenced Sankuyo residents' relationships with their environment. I found an increase in resident knowledge regarding the CBNRM program as well as an increased acknowledgement of benefits derived from local wildlife. Respondents also displayed a higher sense of ownership over the STMT and over their concession. While residents identified similar problems created by wildlife in both interviews, (namely crop raiding by elephants and danger to livestock and people from predators), the large increase in perceived benefits was enough in the second interviews to equalize or overcome those costs in the eyes of most respondents. Keeping this shift in Sankuyo towards a more positive overall outlook on CBNRM and on benefits derived from wildlife will be useful as I transition to consider the analysis from chapter three.

In chapter three, I analyze data from 156 surveys conducted in Shorobe and Sankuyo. These surveys asked residents about their attitudes towards and tolerance of lions and elephants, and also included various questions regarding demographics and livelihood practices, including age, gender, employment, and ownership of livestock. Attitudes were measured using a Likert-like scale, asking "how do you feel about lions/elephants" and providing a choice of 1) very negative, 2) negative, 3) neutral, 4) positive, or 5) very positive. To measure tolerance, I used a series of hypothetical questions regarding each species. For lions, the questions were "should all lions be killed," "if a lion is near a village, should it be

killed," "if a lion has killed a cow, should it be killed," and "if a lion has killed ten cows, should it be killed?"

To analyze this data, I first ran multiple regressions across the entire sample, to test for correlations between various independent variables (gender, age, cattle ownership, and involvement in the tourism industry). Two independent variables showed with the strongest correlation to attitudes and tolerance. The first was age, with people under 40 more likely to have positive attitudes and high tolerance towards both species. The second was tourism involvement, with those currently employed in tourism more likely to have positive attitudes and tolerance. However, there was not a significant different in correlation between those that had previously help jobs in tourism, and those that had not. In addition to regressions, I also did direct comparisons between Sankuyo and Shorobe residents, using chi-square tests to contrast attitudes and tolerance of both lions and elephants. Unsurprisingly, attitudes towards both lions and elephants were significantly more negative in Shorobe compared to those reported in Sankuyo. Shorobe attitudes were almost universally negative for both species, while Sankuyo residents has a more mixed distribution between positive, neutral, and negative reported attitudes. But there was no significant distinction measured in tolerance levels of both species. In particular, the number of people in each village who agreed with the statements "if a lion has killed one cow, should it be killed," and "if an elephant has raided a field, should it be killed," were nearly identical. This suggests that the higher reported attitudes in Sankuyo towards these species might be more related to the current distribution of costs and benefits associated with them, and less because of a more permanent shift in conservation ethic.

In chapter four, my goal was to use a historical, social-ecological approach to provide a synthesis and more holistic picture of my study site. I brought together data from a variety of sources (including the previous two chapters), in order to understand how land use policy has shaped both social and ecological components of the Shorobe/Sankuyo system. When this dissertation research was conceived, I thought of the comparative case study approach as taking advantage of a kind of pseudo-naturalistic experiment (albeit one without replication). In the course of conducting research however, I realized that the reality was more complicated. While the fence and legislation formalized the separation of wildlife and agricultural zones, there has been an informal and incomplete separation that had occurred naturally, as a result of an ecological feature of the area. The area that became NG34 (the wildlife concession north of the fence designated as Sankuyo's tribal land) was the southern edge of tsetse fly habitat, which causes trypanosomiasis in cattle, making serious livestock production untenable. South of NG34 in Shorobe's tribal land, tsetse flies were largely absent. For this reason, residents of Shorobe and Sankuyo created a de-facto separation, where most Sankuyo residents relied on farming, hunting and gathering while Shorobe villagers focused primarily on livestock and farming. But this system included high fluidity between communities and livelihoods. Many Sankuyo residents kept cattle with family members in Shorobe, and some Shorobe farmers regularly made hunting and fishing expeditions into NG34. So while a division of livelihoods existed before the establishment of formal land use designations, this fluidity was largely removed, entrenching livelihood differences and removing some freedom of choice from residents of both communities. While this does present further problems with proving causation for differences in attitudes

between the two communities, it does not invalidate a comparison between them and consideration of similarities and differences. In addition, it provides an example of how historical consideration of a case study can add to the understanding of current interplay between social and ecological components of a system.

Closing Thoughts

When viewed as a whole, it is possible that this dissertation has led to more questions than answers. Proving causation between costs and benefits associated with wildlife and attitudes and behaviors towards them remains difficult. Furthermore, proving direct connections between attitudes, behaviors and conservation outcomes also remains elusive. But by considering local resident attitudes towards and tolerance of local wildlife within a wider historical context and focusing on land use policy, the dissertation has contributed to the scholarly discussion of both CBNRM and human-wildlife conflict. Impacts of a CBNRM project on local resident conservation knowledge as well as perceptions of benefits from local wildlife were documented and explored. This led to an examination of how costs and benefits of wildlife influenced attitudes towards and tolerance of them for two neighboring communities. When the study site is examined as a single, interconnected social-ecological system, I can see that many common conflicts between humans and wildlife are actually symptoms of the decision to have agricultural zones share a boundary with wildlife zones. Seen from this perspective, I hope that new solutions to persistent conservation problems might begin to emerge.

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APPENDIX A

Sankuyo Follow Up Community Survey

What is your position in Community: general member, Trust member, employee of community (circle and state what the position is):_____.

Name:

Age:

Ethnicity:

Gender:

Total number of members in household:

HH members with jobs with joint venture partners or with Trust:

Present Employment:

Work History:

<u>Community Based Natural Resource Management</u>

1a) What does Community Based Natural Resource Management mean? How do you explain what Community Based Natural Resource Management is designed to do?

1b) How has CBNRM affected the whole village of Sankuyo? (*peoples relationships, village problems/conflicts, village improvements, standard of living, cultural improvements)*

1c) Are you satisfied with the CBNRM setup?

Benefits and Conflicts

2a) What means of income did you have before CBNRM (1996)?

2b) What means of income do you have now?

2c) Do you personal receive benefits from CBNRM?

2d) What are the most important benefits of CBNRM?

2e) What have you learned from CBNRM?

2f) What are the major conflicts in the village? And what causes them?

Leadership

3a) Would you say the STMT is managed by a few individuals or is it managaged collectively by the whole membership?

3b) Who actually makes the decisions in the STMT?

Ecological

4a) Is there a decline or an increase in wildlife numbers over the past ten years? What is the cause?

4b) What are the benefits to you from wildlife?

4c) What are the problems from wildlife?

4d) One primary goal of CBNRM is to improve wildlife management. Has CBNRM improved wildlife management practices in NG34 and how?

Future

5a) What are you objectives for the future of the community? (*cultural/social/ecological)*

5b) It is often said that Sankuyo has the most successful CBNRM project in Botswana. Do you agree and how do you measure success?

APPENDIX B

Shorobe/Sankuyo Attitude and Tolerance Survey

Survey Questions:

1a. Name:	b. Age:	c. Sex:	d. Location:	e. Ethnicity:
1a. Leina	*b. Dingwaga*	*c. Bong*	*d. Lefelo*	*e. Letso*

1f. Occupation:
1f. Tiro

2. # of cattle owned:
2. Palo ya leruo

2b. Income (0-500, 500-1000, 1000-5000, >5000):
2b. Dipoelo ka kgwedi

3. # nights/month spent at cattle post:
3. Malatsi a o a tsayang mo morakeng a kae?

4. Relationship to cattle/cattle post (owner, herder, family member, friend):
4. O amana jang le moraka (mong, modisa, losika, kgotsa tsala):

5. Do you receive any income from tourism/delta? If so what position?
5. A o bona dipoelo mo bojanaleng kgotsa makgobokgobo?

6. In the past have you ever worked in tourism? If so what/how long?
6. A o kile wa dira mo bojanaleng, o dira ole eng mo sebakeng se se kae?

7. Does anyone in your family receive any income from tourism/delta?
7. A go nale mongwe wa losika yo o bonang dipoelo mo bojanaleng kgotsa makgobokgobo?

8. Livestock attacked in last three months?
8. A leruo la gago le kile la thaselwa mo kgweding tse tharo tse di fetileng?

Attitude Questions:

9. How do you feel about wildlife: 1-5 (very positive, positive, neutral/no opinion, negative, very negative)

9. Maikutlo a gago ke afe ka diphologolo tsa naga (Di siame mo go feleletseng, di siame, fa gare, ga dia siama kgotsa ga di a siamo gotlhelele)

10. How do you feel about predators: 1-5

10. Maikutlo a gago ke afe ka dibatlana:

11. How do you feel about lions: 1-5

11. Maikutlo a gago ke afe ka ditau:

11a. Why (do you feel that way about lions)?

12. *How do you feel about hyenas: 1-5

Maikutlo a gago ke afe ka diphiri:

13. How do you feel about elephants?: 1-5

13. Maikutlo a gago ke afe ka ditlou:

13a. Why (do you feel that way about elephants)?

14a. Would your life be better if there were no lions in this area?: yes/no

14a. A botshelo jwa gago bo ne bo ka nna bothokwa fa go ne go sena ditau mo lefelong le o nnang mo go lone ? ee/nnyaa

14b. Would your life be better if there were no elephants in this area?

14b. A botshelo jwa gago bone bo ka nna botloka fa go ne go sena ditlou mo lefelong le o nnang mo go lone ?

15. Are lions good for Shorobe/Botswana?

15. A ditau di siametse Shorobe kgotsa Botswana?

Tolerance Questions:
(According to informant's opinion, not according to Botswana laws and regulations)

16. Should all lions be killed?
16. A ditau tsotlhe di tshwanetswe go bolawa?

17. If a lion is near a village, should it be killed?
17. A tau fa e le gaufi le motse ke e bolawe?

18. If a lion is near a cattle post, should it be killed?
18.A tau fa e le gaufi le moraka ke e bolawe?

19. If a lion kills a cow, should it be killed?
19. A fa tau e bolaile kgomo ke e bolawe?

20. If a lion kills 10 cows, should it be killed?
20. A fa tau e ka bolaya dikgomo di le lesome, a e tshwanelwa ke go bolawa?

21. Should all elephants be killed?
21. A ditlou tsotlhe di tshwanelwa ke go bolawa?

22. If an elephant is near a crop field, should it be killed?
22. A fa o bona tlou gaufi le masimo a e tshwanelwa ke go bolawa?

23. If an elephant raids crops, should it be killed?
23. A fa tlou e sentse mo tshimong a e bolawe?

Constraints Questions:
24. If you wished to change occupations, could you?
24. A go nale kgonagala ya tiro nngwe mo boemong jwa e o e dirang?

25. If you wished to work in the tourism industry, could you?
25. A go nale kgonagalo ya go dira mo bojanaleng, fa ele teng?

26. What occupations are available for people in Shorobe?
26. Ke ditiro dife tse di teng mo Shorobe?

27. What do you want your children to be when they grow up? Is that possible in Shorobe?
27. O eletsa ngwana wa gago a ka dira eng fa a gola, a go nale kgonagalo ya teng mo Shorobe?